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**Non Collusion Affidavit**

**Map – Western NC Public Owned / Public Operated Airports**

**Western NC Contract Bid Form**

# **PURCHASE ORDER CONTRACT**

## **Standard Provisions**

### **GENERAL**

This contract is for pavement maintenance activities at various North Carolina airports statewide. The Contractor is to furnish labor, materials, equipment, appropriate traffic control devices and be available to perform the work at any airport within the designated areas of the state.

All work and materials shall be in accordance with the provisions of the General Guidelines of this contract, the Project Special Provisions, the North Carolina Department of Transportation Standard Specifications for Roads and Structures 2006, the current edition of the Manual of Uniform Traffic Control Devices (MUTCD), the Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5370-10B *Standards for Specifying Construction of Airports* (4/25/05) and subsequent changes, and FAA AC 150/5370-2E *Operational Safety on Airports During Construction* (1/17/03).

The Contractor shall keep himself fully informed of all Federal, State and local laws, ordinances, and regulations, and shall comply with the provisions of Section 107 of the Standard Specifications.

### **TERM OF CONTRACT**

The term of this contract is from **April 1, 2007 until March 31, 2008**. At the option of the Division of Aviation, this contract may be extended for two additional periods of one year each for a maximum period of three years total. The unit bid prices will be increased by three percent (3%) for each one-year extension. No changes in the terms, conditions, etc. of this contract will be made when an extension to the contract is implemented. The Engineer will notify the Contractor in writing by March 31, 2008 if the contract may be extended. The Contractor must notify the Engineer in writing within fifteen (15) calendar days of his/her acceptance or rejection of this offer. Failure on the part of the Contractor to reply will be considered as a rejection of contract extension.

### **CONTRACT TIME**

**The date of availability for this contract is April 1, 2007.** The Contractor may begin work prior to this date upon approval of the Engineer or his duly authorized representative. If such approval is given, and the Contractor begins work prior to the date of availability, the Department of Transportation will assume no responsibility for any delays caused prior to the date of availability by any reason whatsoever, and such delays, if any, will not constitute a valid reason for extending the completion date.

No work will be permitted and no purchase order will be issued until all required bonds, prerequisite conditions, and certifications have been satisfied.

**The completion date for this contract is March 31, 2008.** No extensions will be authorized except as authorized by Article 108-10 of the Standard Specifications.

## **INTERMEDIATE CONTRACT TIME AND LIQUIDATED DAMAGES**

The intermediate contract time for a project under this contract is the number of calendar days that is allotted for completion of all work at one airport. The Contractor shall complete the work required at each airport within the number of days as shown on the Airport Maintenance Project Estimate sheet that will be provided to the Contractor in advance of the commencement of any work at that respective airport.

*Note: Intermediate contract time for projects are based on the productivity factors noted in the Productivity Factor Table included in this contract.*

The beginning date for each project's intermediate contract time will be the date the Contractor elects to begin the work at the airport, which will be no sooner than the date of the pre-construction conference for that project.

The completion date for each project's intermediate contract time will be the date which is the number of consecutive calendar days determined and noted in the Airport Maintenance Project Estimate after and including the date the Contractor begins this work.

The liquidated damages for each project's intermediate contract time are **Six Hundred Dollars (\$600.00)** per calendar day.

## **NOTIFICATION OF OPERATIONS**

The Engineer shall notify the Contractor of an airport needing work and provide the plans, details, quantities, and Intermediate Contract Time for that project. The Contractor shall begin work within thirty (30) calendar days after notification or as determined by the Engineer. The Contractor shall notify the Engineer seventy-two (72) hours in advance of beginning work at any airport for this contract. The Contractor shall give the Engineer sufficient notice of all operations for any sampling, inspection or acceptance testing required.

## **SUBLETTING OF CONTRACT**

The Contractor shall not sublet, sell, transfer, assign or otherwise dispose of this contract or any portion thereof; or his right, title, or interest therein; without written consent of the Engineer. Subletting of this contract or any portion of the contract shall conform to the requirements of Article of 108-6 of the Standard Specifications.

## **CONTRACT BID QUANTITIES**

The Contractor shall note that the contract quantities are used for figuring the lowest responsible bidder only. No minimum amount of work is guaranteed under this contract. NC DOT reserves the right to reduce bid line item quantities or delete complete line items.

## **BIDS**

In accordance with GS 136-28.1(b), if the total bid amount of the contract exceeds \$1,200,000, the bid will not be considered for award.

## **AUTHORITY OF THE ENGINEER**

The Engineer for this contract shall be the Airport Development Manager, Division of Aviation, North Carolina Department of Transportation, acting directly or through their duly authorized representatives.

The Engineer will decide all questions which may arise as to the quality and acceptability of work performed and as to the rate of progress of the work; all questions which may arise as to the interpretation of the contract; and all questions as to the acceptable fulfillment of the contract on the part of the Contractor. His decision shall be final and he shall have executive authority to enforce and make effective such decisions and orders as the Contractor fails to carry out promptly.

## **TEMPORARY SUSPENSION OF WORK**

In accordance with Article 108-7 of the Standard Specifications, the Engineer will have the authority to suspend the work wholly or in part, any written order for such periods as he may deem necessary for any of the following reasons.

Conditions considered unfavorable for the suitable prosecution of the work, or

the Contractor's failure to correct conditions unsafe for workmen or the general public, or

the Contractor has not carried out orders given to him by the Engineer, or

the Contractor's failure to perform any provisions of the contract.

No extension of projects' completion date will be allowed for the above suspensions except as may be provided for in Article 108-10.

## **LIABILITY INSURANCE**

The Contractor shall obtain from an insurance company, duly authorized to do business in North Carolina, Public Liability and Property Damage Insurance to protect his company and subcontractors performing work covered under this contract from claims that may arise from operations under this contract. Insurance coverage shall be maintained during the life of this contract and shall extend to operations performed by the Contractor or his subcontractors, and by anyone employed directly or indirectly by either of them.

Public Liability Insurance shall be in an amount not less than one million dollars (\$1,000,000.00) for injuries, including accidental death, to any one person, and subject to the same limit for each person, in an amount not less than one million dollars (\$1,000,000.00) on account of one accident.

Property Damage Insurance shall be in an amount not less than five hundred thousand dollars (\$500,000.00).

Proof of insurance shall be furnished to the Engineer prior to beginning work.

## **CONTRACT PAYMENT AND PERFORMANCE BOND**

Bonds can be for either one hundred percent (100%) of the contract amount, maintained for the duration of the contract, or can be for one hundred percent (100%) of the estimated amount for each project that totals more than \$300,000, for the duration of that particular project. When required, Contractor must provide proof of bonds before any work will be allowed.

A performance bond in the amount of one hundred percent (100%) of the project amount, conditioned upon the faithful performance of the contract in accordance with specifications and conditions of the contract is required for Construction contracts of \$300,000 or more. Such bond shall be solely for the protection of the North Carolina Department of Transportation, the State of North Carolina, and the airports included in this contract.

A payment bond in the amount of one hundred percent (100%) of the project amount, conditioned upon the prompt payment for all labor or materials for which the Contractor or his subcontractors are liable, is required for Construction contracts greater than \$300,000.

The payment bond shall be solely for the protection of persons or firms furnishing materials or performing labor for this contract for which the Contractor is liable.

The Contractor, within fourteen (14) days after notification of a project, shall provide the Department with a contract payment bond and a contract performance bond each in an amount equal to one hundred percent (100%) of the amount of the total contract or for one hundred percent (100%) of the estimated amount for the current project if the estimated amount for that project exceeds \$300,000.

## **PRE-CONSTRUCTION CONFERENCE**

In accordance with Section 108-3 of the Standard Specifications, a pre-construction conference will be required prior to beginning work at each airport. Attendance by the Contractor is mandatory and attendance by subcontractors is as required by the Engineer. The date, time, and location of the pre-construction conference shall be established at the time the Contractor is notified about the project. The Contractor shall notify the Engineer and the Airport Manager at least 72 hours prior to the date that the Contractor plans to begin the work at that airport.

## **EXTENSION OF CONTRACT TIME**

Failure on the part of the Contractor to furnish bonds or certifications, or to satisfy preliminary requirements necessary to issue the purchase order will not constitute grounds for extension of the contract time. If the Contractor has fulfilled all preliminary requirements for the issuance of a purchase order, and the purchase order authorization is not available by the date of availability, the Contractor shall be granted an extension equal to the number of calendar days the purchase order authorization is delayed after the date of availability.

## **DEFAULT OF CONTRACT**

The Department of Transportation shall have the right to declare a default of contract for breach by the Contractor of any material term or condition of the contract. Default of contract shall be in accordance with the terms, conditions, and procedures of Article 108-9 of the Standard Specifications.

## **SUPERVISION BY CONTRACTOR**

**At all times** during the life of the project the Contractor shall provide one permanent employee who shall have the authority and capability for overall responsibility of the project and who shall be personally available at the work site within twenty-four (24) hours notice. Such an employee shall be fully authorized to conduct all business with the

subcontractors, to negotiate and execute all supplemental agreements, and to execute the orders or directions of the Engineer.

**At all times** that work is actually being performed, the Contractor shall have present on the project one competent individual who is authorized to act in a supervisory capacity over all work on the project, including work subcontracted. The individual who has been so authorized shall be experienced in the type of work being performed and shall be fully capable of managing, directing, and coordinating the work; shall have a copy of this complete contract with them and be capable of reading and thoroughly understanding the contract; and receiving and carrying out directions from the Engineer or his authorized representatives. He shall be an employee of the Contractor unless otherwise approved by the Engineer.

The Contractor may, at his option, designate one employee to meet the requirements of both positions. However, whenever the designated employee is absent from the work site, an authorized individual qualified to act in a supervisory capacity on the project shall be present.

## **INSPECTION**

All work shall be subject to inspection by the Engineer at any time. Routinely, the Engineer will make periodic inspections of the completed work. It will be the responsibility of the Contractor to keep the Engineer informed of his proposed work plan and to submit written reports of work accomplished on a frequency to be determined by the Engineer.

The Contractor shall not perform work without the presence of the Engineer or his authorized representative(s), unless previously approved by the Engineer. Any work done without the presence of the Engineer is subject to nonpayment, unless approved by the same.

## **PAYMENT AND RETAINAGE**

The Contractor may submit a request for partial payment on a monthly basis, or other interval as approved by the Engineer. Compensation for all pay items shall be in accordance with the Standard Specifications. The amount of partial payments will be based on the work accomplished and accepted.

Request for payment should be made by Contractor's Invoice, the Invoice shall be submitted to:

**NCDOT – Division of Aviation  
Attn: Jonathan L. Arnold, P.E.  
1560 Mail Service Center  
Raleigh, NC 27699-1560**



All invoice items and unit costs shall correspond to contract pay items. In the event of error or discrepancy in items or unit costs, the Department may contact the Contractor and/or return the invoice to the Contractor for correction.

Minority Business (MB) and Women's Business (WB) participation shall be listed in the appropriate spaces on all requests for payment. If there is no participation the word "None" or the figure "0" shall be entered.

One hundred percent (100%) payment shall be made after successful completion of the work as verified by the final inspection.

## **RETAINAGE AND PROMPT PAYMENT OF SUBCONTRACTORS AND SUPPLIERS**

Contractors at all levels; prime, subcontractor, or second tier contractor, shall within seven calendar days of receipt of monies, resulting from work performed on the project or services rendered, pay subcontractors, second tier subcontractors, or material suppliers, as appropriate. This seven-day period begins upon knowledgeable receipt by the contracting firm obligated to make a subsequent periodic or final payment. These prompt payment requirements will be met if each firm mails the payment to the next level firm by evidence of postmark within the seven-day period.

This provision for prompt payment shall be incorporated into each subcontract or second tier subcontract issued for work performed on the project or for services provided.

The Contractor may withhold up to 3% retainage if any subcontractor does not obtain a payment and performance bond for their portion of the work. If any retainage is held on subcontractors, all retainage shall be released within seven calendar days of satisfactory completion of all work. For the purpose of release of retainage, satisfactory completion is defined as completion of all physical elements and corresponding documentation as defined in the contract, as well as agreement between the parties as to the final quantities for all work performed in the subcontract. The Department will provide internal controls to expedite the determination and processing of the final quantities for the satisfactorily completed subcontract portions of the project.

Failure of any entity to make prompt payment as defined herein may result in (1) withholding of money due to that entity in the next partial payment until such assurances are made satisfactory to this provision; or (2) removal of an approved contractor from the prequalified bidders list or the removal of other entities from the approved subcontractors list.

## **MATERIALS AND TESTING**

The Engineer reserves the right to perform all sampling and testing in accordance with Section 106 of the Standard Specifications and the Department's "Materials and Test Manual." However the Engineer may reduce the frequency of sampling and testing where he deems it appropriate for the project under construction.

The Contractor shall furnish the applicable certifications and documentation for all materials as required by the Standard Specifications. Material, which is not properly certified, will not be accepted.

## **WASTE MATERIAL DISPOSAL**

All waste material shall be removed from the project site prior to one hundred percent (100%) project completion. All waste disposal shall be in accordance with Federal, State, and local regulations regarding the disposal of waste material(s). All permits and fees for any such disposal shall be the responsibility of the Contractor, and NC DOT shall not be held liable for any such disposal of material(s). No separate payment will be made for Waste Material Disposal.

## **CLAIMS FOR ADDITIONAL COMPENSATION OR EXTENSION OF TIME**

Any claims for additional compensation and/or extensions of the project completion date shall be submitted to the Engineer with detailed justification within thirty (30) days after receipt of the final invoice payment. The failure of the Contractor to submit the claim(s) within thirty (30) days shall be a bar to recovery.

## **POSTED WEIGHT LIMITS**

The Contractor's attention is directed to the fact that many primary and secondary roads and bridges are posted with weight limits less than the legal limit. The Contractor will not be allowed to exceed the posted weight limits in transporting materials or equipment to the project. The Contractor should make a thorough examination of all maps and haul routes leading to each airport.

## **AVAILABILITY OF FUNDS - CONTRACT TERMINATION**

Payments on this contract are subject to availability of funds as allocated by the General Assembly. If the General Assembly fails to allocate adequate funds, the Department reserves the right to terminate this contract.

In the event of termination, the Contractor shall be given a written notice of termination at least 60 days before completion of scheduled work for which funds are available. In the event of termination, the Contractor shall be paid for the work already performed in accordance with the contract specifications.

## **BANKRUPTCY**

The Department of Transportation, at its option, may terminate the contract upon filing by the Contractor of any petition for protection under the provisions of the Federal Bankruptcy Act.

## **EROSION, SILTATION, AND POLLUTION CONTROL**

The Contractor shall exercise every reasonable precaution and take all necessary measures throughout the life of the project to prevent erosion, siltation, and pollution in accordance with Section 107-13 of the Standard Specifications. Silt fence and erosion control measures shall be installed in accordance with Section 1605 of the Standard Specifications and in locations directed by the Engineer or his representative.

## **MINORITY AND WOMEN BUSINESS**

### **POLICY**

It is policy of the North Carolina Department of Transportation that minority and women businesses shall have the maximum opportunity to participate in the performance of contracts financed by Non-Federal Funds.

The Contractor is also encouraged to give every opportunity to allow MBE/WBE participation in Supplemental Agreements.

### **OBLIGATION**

The Contractor and any subsequent Subcontractor shall ensure that minority and women businesses have the maximum opportunity to participate in the performance of the work included in this contract. The Contractor and any subsequent Subcontractor shall take all necessary and reasonable steps to ensure that minority and women businesses have the

maximum opportunity to compete for and perform a portion of the work included in this contract and shall not discriminate on the basis of race, color, national origin or sex. Failure on the part of the Contractor to carry out the requirements set forth herein shall constitute a breach of contract and after proper notification, may result in award disqualification, termination of the contract, disqualification from bidding, or other appropriate remedy.

## **GOALS**

Pursuant to the requirements of North Carolina General Statute 136-28.4, the following goals for participation are established for this contract:

Minority Business Enterprises 0 %  
Women Business Enterprises 0 %

The Contractor shall exercise all necessary and reasonable steps to ensure that Minority Businesses (MB) and Women Businesses (WB) participate in at least the percents of the contract as set forth above as goals for this contract.

## **LISTING OF MB AND WB SUBCONTRACTORS**

All bidders, at the time the bid proposal is submitted, must also submit a listing of MB and WB participation on the appropriate form (or facsimile thereof) contained elsewhere in this proposal in order for the bid to be considered responsive. Bidders must indicate the total dollar value of MB and WB participation of the contract. In the event the bidder has no MB and WB participation, he is still required to indicate this on the forms by entering the word or number zero. Blank forms will not be deemed to represent zero participation. BIDS SUBMITTED WHICH DO NOT HAVE MB AND WB PARTICIPATION INDICATED ON THE APPROPRIATE FORM WILL NOT BE READ PUBLICLY DURING THE OPENING OF BIDS. These bids will not be considered for award by the Department and they will be returned to the bidder. Bidders have the option of submitting their MB and WB participation in an abbreviated format as required in Paragraph A below, or the bidders may submit their MB and WB participation in the additional detail required by Paragraph B below. In the event the bidder elects to submit MB and WB participation in accordance with Paragraph A and is determined to be the apparent lowest responsive bidder, that bidder must deliver to the Department no later than 12:00 noon of the sixth day following the opening of bids, a detailed MB and WB submittal as required by Paragraph B below.

Only those MB and WB firms with current certification by the Department will be considered acceptable for listing in the bidders submittal of MB and WB participation.

## **REQUIRED INFORMATION:**

- A. The contractor shall indicate on the form for listing of MB and WB Subcontractors the following required information:

- (1) The names of MB and WB firms committed to participate in the contract;
- (2) The Contract Item Numbers of work to be performed by each MB and WB firm; and
- (3) The total dollar amount to be paid to each MB and WB based on agreed upon unit prices.

Failure to indicate the required information on the specified form will cause the bid to be considered nonresponsive and it may be rejected.

B. In lieu of submitting the information required by (A) above, the bidder may submit the detailed information required below along with the bid proposal form.

- (1) The names of MB and WB firms committed to participate in the contract;
- (2) The Contract Item Numbers and Contract Item Descriptions and agreed upon unit prices of work to be performed by each MB and WB firm; and
- (3) The total dollar amount to be paid to each MB and WB based on agreed upon unit prices.

Failure to indicate the required information on the specified form will cause the bid to be considered nonresponsive and it may be rejected.

The Department will not allow any substitutions, deletions, or other alterations to the listing of firms committed for MB and WB participation and/or the respective listed contract item numbers after opening of bids. The Department will not allow adjustments to total dollar amount of MB and/or WB participation after the opening of bids which would result in the MB and/or WB participation being less than the contract goal. The only exceptions to the requirements of this paragraph will be: (1) to allow for replacement of a MB or WB firm that had been decertified after opening of bids, and (2) to allow alteration of the listed contract item numbers subject to the Bidder submitting sufficient documentation to verify an obvious error in the initial submittal.

C. If the bid of the lowest responsive bidder exceeds \$500,000 and if the MB and/or WB participation submitted in response to Paragraph B exceeds the algebraic sum of the MB and WB goals by \$1000 or more, the excess will be placed on deposit by the Department for future use by the bidder. Separate accounts will be maintained for MB and WB participation and these may accumulate for a period not to exceed 24 months.

If the MB and WB participation submitted in response to Paragraph A/B does not meet or exceed the MB and WB contract goals, the apparent lowest responsive bidder must submit information to satisfy the North Carolina Department of

Transportation that sufficient reasonable efforts have been made to meet the contract goals. One complete set and nine (9) copies of this information must be received in the Engineer's office no later than 12:00 noon of the sixth day following opening of bids. Where the information submitted includes repetitious solicitation letters it will be acceptable to submit a sample representative letter along with a distribution list of the firms being solicited. Documentation of MB and WB quotations shall be a part of the good faith effort submittal as necessary to demonstrate compliance with the factors listed below which the Department considers in judging good faith efforts. This documentation may include written subcontractor quotations, telephone log notations of verbal quotations, or other types of quotation documentation.

Where the bidder fails to provide this information by the deadline, the Department may impose the following sanctions: (1) disqualify the contractor and any affiliated companies from further bidding for a period of time of no more than 90 days from the date of disqualification as established in notification by certified mail; and (2) disqualify the Contractor and any affiliated companies for award of all contracts for which bids have been received and opened.

The following factors are what the Department will consider in judging whether or not the bidder has made adequate good faith effort:

- (1) Whether the bidder attended any pre-bid meetings that were scheduled by the Department to inform MBs and WBs of subcontracting opportunities;
- (2) Whether the bidder provided written notice to a reasonable number of specific MBs and WBs that their interest in the contract is being solicited and whether the firms solicited could have reasonably been expected to quote the work in the contract;
- (3) Whether the bidder followed up on initial solicitations of interests by contacting MBs and WBs to determine with certainty whether they were interested;
- (4) Whether the bidder selected portions of the work to be performed by MBs and WBs in order to increase the likelihood of meeting the contract goals;
- (5) Whether the bidder provided interested MBs and WBs with adequate information about the plans, specifications and requirements of the contract;
- (6) Whether the bidder negotiated in good faith with interested MBs and Wbs not rejecting them as unqualified without sound reasons based on a thorough investigation of their capabilities;

- (7) Whether quotations were received from interested MB and WB firms but rejected as unacceptable without sound reasons why the quotations were considered unacceptable;
- (8) Whether the bidder made efforts to assist interested MBs and WBs in obtaining any required insurance or bonding that may be required by the bid proposal or by the bidder;
- (9) Whether the bidder specifically negotiated with Subcontractors to assume part of the responsibility to meet the contract MB and WB goal when the work to be sublet includes potential for MB and WB participation.

In the event one bidder is the apparent low bidder on two non-federally funded projects within the same letting located in the same geographic area of the state, as a part of the good faith effort the Department will consider allowing the bidder to combine the MB participation on the two projects so long as the overall MB goal value of both projects is achieved.

In the event one bidder is the apparent low bidder on two non-federally funded projects within the same letting located in the same geographic area of the state, as a part of the good faith effort the Department will consider allowing the bidder to combine the WB participation on the two projects so long as the overall WB goal value of both projects is achieved.

Where the apparent lowest responsive bidder fails to submit sufficient participation by MB firms to meet the contract goal, as part of the good faith effort the Department will consider allowing the bidder to withdraw funds to meet the MB goal so long as there are adequate funds available from the bidders MB bank account.

Where the apparent lowest responsive bidder fails to submit sufficient participation by WB firms to meet the contract goal, as part of the good faith effort the Department will consider allowing the bidder to withdraw funds to meet the WB goal so long as there are adequate funds available from the bidders WB bank account.

Where the apparent lowest responsive bidder fails to submit sufficient participation by MB and WB firms to meet the contract goal and upon a determination by the Goal Compliance Committee based upon the information submitted that the apparent lowest responsive bidder failed to make sufficient reasonable efforts to meet the contract goal, the Department may reject the bid.

In the event that the Department does not award the contract to the apparent lowest responsive bidder, the Department reserves the right to award the contract to the next lowest responsive bidder that can satisfy the Department

that the contract goal can be met or that adequate good faith efforts have been made to meet the goal.

### **DIRECTORY OF CERTIFIED BUSINESSES**

Only those MB firms with current certification with the Unified Certification Program (UCP) administered by the North Carolina Department of Transportation may be used to meet the contract MB goal.

The listing of an individual firm certified by the Department shall not be construed as an endorsement of the firms capability to perform certain work.

### **REPLACEMENT OF MBs AND WBs**

#### **(A) Performance Related**

If any MB or WB Subcontractor indicated on the form for listing of MB and WB Subcontractors, contained elsewhere in this proposal form, does not perform satisfactorily to the extent indicated or anticipated, the Contractor shall take all necessary, reasonable steps to replace the MB Subcontractor with another MB Subcontractor and/or the Contractor shall take all necessary, reasonable steps to replace the WB Subcontractor with another WB Subcontractor.

Any substitution of MB or WB firms after award of the contract shall be approved by the Department. The Contractor shall submit any requests for substitutions through the Resident Engineer and the request must provide a valid basis or reason for the proposed substitution.

To demonstrate necessary, reasonable efforts, the Contractor shall document the steps he has taken to replace any MB or WB Subcontractor that is unable to perform successfully with another MB or WB Subcontractor. Such documentation shall include but not be limited to the following:

- (a) Copies of written notification to MBs/WBs that their interest is solicited in subcontracting the work defaulted by the previous MB or WB Subcontractor or in subcontracting other items of work in the contract.
- (b) Efforts to negotiate with MBs and WBs for specific subbids including at a minimum:
  - (1) The names, addresses, and telephone numbers of MBs and WBs that were contacted;
  - (2) A description of the information provided to MBs and WBs regarding the plans and specifications for portions of the work to be performed; and



- (3) A statement of why additional agreements with MBs and WBs were not reached.
- (c) For each MB or WB contacted but rejected as unqualified, the reasons for the Contractor's conclusion.
- (d) Efforts made to assist the MBs and WBs contacted, if needed, in obtaining bonding or insurance required by the Contractor.

Failure of the Contractor to demonstrate reasonable efforts to replace a MB or WB firm that does not perform as intended or anticipated, shall be just cause to disqualify the Contractor from further bidding for a period of up to 6 months after notification by certified mail.

(B) Decertification

1. If the Department has approved a Request for Subcontract for a particular MB or WB Subcontractor and that MB or WB Subcontractor is subsequently decertified by the Department; then the Department will not require the Prime Contractor to solicit replacement MB or WB participation equal to the remaining work to be performed by the decertified firm.
2. If a Prime Contractor has listed a MB or WB firm in his low bid submittal and the MB or WB firm is decertified prior to the Department approving a Request for Subcontract for the named MB or WB firm, the Prime Contractor may be required to make a good faith effort to:
  - (a) Replace the decertified firm with a certified firm, or
  - (b) To obtain replacement MB or WB participation in other areas of work.

**DEFINITIONS**

For purposes of this provision, the following definition will apply:

Minority Business or MB means a small business concern, which is owned and controlled by one or more minorities. Except that such term shall not include any concern or group of concerns controlled by the same minority or minorities which has average annual gross receipts over the preceding three fiscal years in excess of \$14,000,000, as adjusted by the Department for inflation. For the purposes of this part, owned and controlled means a business:

- (a) Which is at least 51 percent owned by one or more minorities or in the case of a publicly owned business, at least 51 percent of the stock of which is owned by one or more minorities; and
- (b) Whose management and daily business operations are controlled by one or more such individuals.

Minority is defined as a citizen or lawful permanent resident of the United States and who is:

- (1) Black (a person having origins in any of the black racial groups of Africa);
- (2) Hispanic (a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race);
- (3) Asian American (a person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands);
- (4) American Indian

Women Business or WB means a small business concern, which is owned and controlled by one or more women. Except that such term shall not include any concern or group of concerns controlled by the same woman or women which has average annual gross receipts over the preceding three fiscal years in excess of \$14,000,000, as adjusted by the Department for inflation. For the purposes of this part, owned and controlled means a business:

- (a) Which is at least 51 percent owned by one or more women or in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and
- (b) Whose management and daily business operations are controlled by one or more of the women who own it.

#### **COUNTING MB/WB PARTICIPATION TOWARD MEETING THE MB/WB GOAL**

- (1) If a firm is determined to be an eligible MB or WB firm and certified by the Department, the total dollar value of the participation by the MB or WB will be counted toward the appropriate MB or WB goal. The total dollar value of participation by a certified MB or WB will be based upon unit prices agreed upon by the Prime Contractor and MB or WB Subcontractor.
- (2) The Contractor may count toward its MB or WB goal a portion of the total dollar value of participation with a joint venture, eligible under the standards of this

provision, equal to the percentage of the ownership and controls of the MB or WB partner in the joint venture.

- (3)
  - (a) The Contractor may count toward its MB or WB goal only expenditures to MBs or WBs that perform a commercially useful function in the work of a contract. A MB or WB is considered to perform a commercially useful function when it is responsible for execution of a distinct element of the work of a contract and carrying out its responsibilities by actually performing, managing, and supervising the work involved. To determine whether a MB or WB is performing a commercially useful function, the Department will evaluate the amount of work subcontracted, industry practices, and other relevant factors.
  - (b) Consistent with normal industry practices, a MB or WB may enter into subcontracts. If a MB or WB Contractor or Subcontractor subcontracts a significantly greater portion of the work of the contract than would be expected on the basis of normal industry practices, the MB or WB shall be presumed not to be performing a commercially useful function. The MB or WB may present evidence to rebut this presumption to the Department. The Departments decision on the rebuttal of this presumption shall be final.
- (4) A Contractor may count toward its MB or WB goal 60 percent of its expenditures for materials and supplies required to complete the contract and obtained from MB or WB regular dealer and 100 percent of such expenditures to a MB or WB manufacturer.
  - (a) For purposes of this provision, a manufacturer is a firm that operates or maintains a factory or establishment that produces on the premises the materials or supplies obtained by the Contractor.
  - (b) For purposes of this provision, a regular dealer is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials or supplies required for the performance of the contract are bought, kept in stock, and regularly sold to the public in the usual course of business. To be a regular dealer, the firm must engage in, as its principal business and in its own name, the purchase and sale of the products in question. A regular dealer in such bulk items as steel, cement, gravel, stone, and petroleum products need not keep such products in stock, if it owns or operates distribution equipment. Brokers and packagers shall not be regarded as manufacturers or regular dealers within the meaning of this section.
- (5) A contractor may count toward its MB or WB goal the following expenditures to MB or WB firms that are not manufacturers or regular dealers:

- (a) The fees or commissions charged for providing a bona fide service, such as professional, technical, consultant or managerial services and assistance in the procurement of essential personnel, facilities, equipment, materials or supplies required for performance of the contract, provided that the fee or commission is determined by the Department to be reasonable and not excessive as compared with fees customarily allowed for similar services.
- (b) The fees charged for delivery of materials and supplies required on a job site (but not the cost of the materials and supplies themselves) when the hauler, trucker, or delivery service is not also the manufacturer of or a regular dealer in the materials and supplies, provided that the fee is determined by the Department to be reasonable and not excessive as compared with fees customarily allowed for similar services.
- (c) The fees or commissions charged for providing any bonds or insurance specifically required for the performance of the contract provided that the fee or commission is determined by the Department to be reasonable and not excessive as compared with fees customarily allowed for similar services.

## **REPORTS**

Within 30 days after receipt of materials, supplies, or services from MBs or WBs, not otherwise documented by Request for Subcontracts (RS-1A/RS-1B), the Contractor shall furnish to the Engineer appropriate documentation (canceled checks, paid invoices, etc.) to verify expenditures with MB and WB concerns. The documentation should also indicate the percentage (60% or 100%) of expenditures claimed for MB or WB credit.

All requests for subcontracts involving MB or WB Subcontractors shall be accompanied by a certification executed by both the Prime Contractor and the MB or WB Subcontractor attesting to the agreed upon unit prices and extensions for the affected contract items. This document shall be on the Departments Form RS-1-D, or in lieu of using the Departments Form, copies of the actual executed agreement between the Prime Contractor and the MB or WB Subcontractor may be submitted. In any event, the Department reserves the right to require copies of actual subcontract agreements involving MB and WB Subcontractors.

The RS-1-D certification forms may be obtained from the Departments Resident Engineer.

These certifications shall be considered a part of the project records, and consequently will be subject to any penalties under State Law associated with falsifications of records related to projects.

## **REPORTING MINORITY BUSINESS ENTERPRISE OR WOMEN BUSINESS ENTERPRISE PARTICIPATION**

When payments are made to Minority Business Enterprise firms or Women Business Enterprise firms, including material suppliers, contractors at all levels (prime,

subcontractor, or second tier subcontractor) shall provide the Engineer with an accounting of said payments. This accounting shall be furnished the Engineer for any given month by the end of the following month. Failure to submit this information accordingly may result in (1) withholding of money due in the next partial pay estimate; or (2) removal of an approved Contractor from the prequalified bidders list or the removal of other entities from the approved subcontractors list. The accounting shall list for each payment made to a MB/WB Enterprise firm the following:

- DOT Project Number
- Payee Contractor Name
- Receiving Contractor or Material Supplier (Name)
- Receiving Contractor or Material Supplier (Reporting Number)
- MB/WB Certification Basis, e.g., Woman Owned, Native American, African American, etc.
- Amount of Payment
- Date of Payment

A responsible fiscal officer of the payee contractor, subcontractor, or second tier subcontractor who can attest to the date and amounts of the payments shall certify that the accounting is correct. A copy of an acceptable report may be obtained from the Engineer.

# **PURCHASE ORDER CONTRACT**

## **Special Provisions**

### **PROPOSED WORK PLAN**

The Contractor shall prepare and submit to the Engineer a proposed work plan prior to beginning work on this project. The work plan should indicate the proposed chronological sequence of operations including duration of activities and may be revised within the limits of the contract with the approval of the Engineer. This work plan will also be used to advise the Airport regarding the impact of the work being performed on its daily operations so that the Airport can communicate this information to its users and the public.

### **WORK ZONE SAFETY AND TRAFFIC CONTROL**

In accordance with Article 107-22 of the Standard Specifications, the Contractor shall comply with all applicable Federal, State, and local laws, ordinances, and regulations governing safety, health, and sanitation, and shall provide all safeguards, safety devices, and protective equipment, and shall take any other needed actions, on his own responsibility that are reasonably necessary to protect the life and health of employees on the job and the safety of the public, and to protect property in connection with the performance of the work covered by the contract.

The Contractor shall maintain aviation and vehicular traffic to the extent directed by the Engineer during construction and provide, install, and maintain all traffic control devices in accordance with these project guidelines, the Project Special Provisions, the North Carolina Department of Transportation Standard Specifications for Roads and Structures 2006, the current edition of the Manual of Uniform Traffic Control Devices (MUTCD), and the current edition of FAA AC 150/5370-2E *Operational Safety on Airports During Construction* (1/17/03).

### **SAFETY PLAN REQUIREMENTS**

1. Airport Air Operations Areas will be closed to air traffic on an intermittent basis to facilitate operations during this project. However, no areas will be closed unless both the Airport Manager and the Engineer approve.
2. The Contractor shall not begin work within any Air Operations Area unless and until seventy-two (72) hours prior notice has been given to the Engineer and the Airport Manager.

3. The Contractor shall utilize complete and proper traffic controls and traffic control devices during all operations. All traffic control and traffic control devices required for any operation shall be functional and in place prior to the commencement of that operation. (See enclosed details) Signs for temporary operations shall be removed during periods of inactivity. The Contractor is required to leave the project in a manner that will be safe to aviation, pedestrian and vehicular traffic.
4. When a runway has to be closed for work on this contract, the Contractor shall furnish and place crosses at each end of the runway prior to commencing any work to the pavement. Crosses shall be in accordance with the details as shown in these plans and in accordance with FAA AC 150/5340-1J (4/29/05), or current version. Crosses shall remain in good condition until completion of the project. On airports having multiple runways where air traffic will be maintained, the Contractor will be required to furnish, erect, and maintain barricades and/or warning signs necessary to protect the public and the work as deemed necessary by the Engineer and Airport Management. On multiple runway airports one runway must remain open at all times except for time when work is required at intersection of the two runways.
5. The Contractor must be capable of maintaining two-way radio communications with the airport for increased safety.
6. The Contractor shall coordinate ingress-egress requirements with the Airport Manager. The Contractor shall be responsible for securing all gates at the end of each day's operations.
7. The Contractor shall identify each motorized vehicle or piece of construction equipment in reasonable conformance to the FAA Advisory Circular 150/5370-2E, "Operational Safety on Airports During Construction." (Copies of the Advisory Circular are available upon request and can be viewed online at [http://www.faa.gov/airports\\_airtraffic/airports/resources/advisory\\_circulars/media/150-5370-2E/150\\_5370\\_2e.pdf](http://www.faa.gov/airports_airtraffic/airports/resources/advisory_circulars/media/150-5370-2E/150_5370_2e.pdf))
8. Equipment and materials shall not be left on or within 200-feet of the runway edges or 50-feet of the taxiway edges after work operations are ceased each day.
9. The Contractor shall keep all active airfield pavements clear of debris, stones, etc., during construction. These areas shall be cleaned of construction debris and spillage immediately. The Contractor shall visually inspect active airfield pavement after each crossing by vehicles during hauling operations.
10. The Contractor shall clean all construction areas of litter, loose papers, debris, etc., on a daily basis, or as directed by the Engineer or Airport Manager. All spillage in active Air Operation Areas shall be cleaned up immediately. The Contractor will be required to have a power broom available on site whenever crack routing or other maintenance activities generate appreciable foreign object debris (FOD). Other methods of cleaning may be used if approved by the Engineer.

11. Men, equipment or other construction-related material will be permitted in the approach or departure zones of active runway, provided that the construction activity is conducted below the 20:1 approach plane of reference originating 200-feet from the threshold end of the runway. Any construction activity that is in the approach zones, which will violate these planes of reference, will require special consideration and specific approval. (See enclosed detail)
12. Open trenches, excavation, drop-offs, and stockpiled material will not be permitted within 200-feet of active runway edges or within 50-feet of active taxiway edges, unless approved by the Engineer. Coverings for open trenches must be of such strength to support critical vehicles as determined by the Engineer or the Airport Manager.
13. The Contractor shall furnish flaggers as required by the operation being conducted and as directed by the Engineer. In situations where sight distance is limited, or where greater distances are involved, the Contractor shall provide additional means of controlling traffic, including, but not limited to, two-way radios, pilot vehicles, or additional flaggers.
14. **At all times**, all personnel shall wear an approved safety vest, or shirt or jacket which meets the color requirements of the Manual of Uniform Traffic Control Devices (MUTCD).
15. The Contractor shall provide for the free and unobstructed movement of aircraft on areas of the airport not affected by the project. The Contractor shall at all times conduct his operations as to create no hindrance, hazard, or obstacle to aircraft using the airport and must, at all times, conduct the work in accordance with requirements of the Engineer and Airport Management.
16. Failure to comply with any of the requirements for safety and traffic control of this contract shall result in suspension of work as provided in subarticle 108-7(2) of the Standard Specifications.
17. All costs incurred in complying with the above requirements shall be considered work under this contract and no additional payment therefore shall be made.



## **PROSECUTION AND PROGRESS**

The Contractor shall pursue the work diligently with workmen in sufficient numbers, abilities, and supervision, and with equipment, materials, and methods of construction as may be required to complete the work described in the contract by the Intermediate Contract Time limit and in accordance with Section 108 of the Standard Specifications.

The Contractor's operations are restricted to pavement areas and times that are approved by the Engineer and Airport Manager. No work may be performed on Sundays and legal State holidays. Work shall only be performed when weather and visibility conditions allow safe operations.

The Contractor shall temporarily remove his equipment from the travelway for declared emergencies, emergency vehicles, and traffic as directed by the Engineer.

Once work begins at an airport, the work must be completed without interruptions or breaks in the project. For example, the Contractor will not be allowed to start work on an airport and work for a day then stop work and begin there again the next week without approval from the Engineer. The work is to be completed in consecutive contract days once work has begun. One exception is the required application of a herbicide and the required period of time necessary to allow the chemical to effectively work prior to the commencement of further work.

## **STATE APPROVED HOLIDAYS**

The following is a listing of legal State holidays for 2007:

New Years	January 1	Monday
MLK, Jr. Birthday	January 15	Monday
Good Friday	April 6	Friday
Memorial Day	May 28	Monday
Independence Day	July 4	Wednesday
Labor Day	September 3	Monday
Veteran's Day	November 12	Monday
Thanksgiving	November 22 & 23	Thursday & Friday
Christmas	December 24-26	Monday - Wednesday

## **NIGHT OPERATIONS**

This contract is intended for daylight operations only, however the Contractor may, with the approval of the Engineer and Airport, conduct his operations during night hours. Any additional compensation the Contractor requests for conducting night operations at the request of the Airport, shall be funded by the Airport with 100% local funds. For the

purposes of this contract, night hours shall be defined as the period between dusk and dawn when natural light, as determined by the Engineer or his representative, is insufficient to safely and effectively perform contract operations.

If the Contractor elects to perform any phase of this contract during night hours, he shall submit, in writing, to the Engineer, a full and complete plan for traffic control and construction lighting which shall be approved prior to beginning construction.

All traffic control devices shall meet the requirements for night use as set forth in the Standard Specifications and the current edition of FAA AC 150/5370-2E *Operational Safety on Airports During Construction* (1/17/03).

## **PLAN, DETAIL, AND QUANTITY ADJUSTMENTS**

NCDOT reserves the right, at anytime during the progress of the work, to make alterations in the plans or details of construction as may be found necessary or desirable by the Engineer to complete the project.

## **TAXIWAYS AND PRIVATE PROPERTY**

The Contractor shall maintain access to taxiways for all residents, businesses, and property owners throughout the life of the project.

The Contractor shall not perform work for private citizens or agencies in conjunction with this project or within the project limits of this contract.

## **USE OF TAXIWAYS FOR TAKEOFF AND LANDING OPERATIONS**

The use of taxiways for takeoff and landing operations while work is being conducted under this contract is strongly discouraged due to the inherent safety risks associated with such operations to both the aircraft occupants and personnel on the ground.

## **PAVEMENT DAMAGE**

It will be the responsibility of the Contractor to ensure that no damage is done to the existing pavement structure due to the Contractor's equipment. It shall be the responsibility of the Contractor to repair or replace any damaged pavement back to a satisfactory condition as determined by the Engineer. Airport pavement strengths are available and reported in maximum allowable aircraft single wheel (SW) loading. Single wheel loading strength is the standard reporting value required by FAA.

# MOBILIZATION

## **DESCRIPTION:**

This item consists of preparatory work and operations, including but not limited to the movement of personnel, equipment, supplies, and incidentals to each airport project site and to perform the required work and the removal and disbandment of those personnel, equipment, supplies, or incidentals that were used for the prosecution of the work. The airport project sites are either identified in this contract or will be identified to the Contractor by the Engineer no later than forty-five (45) days prior to the completion date of this contract.

## **COMPENSATION:**

All work covered by this section will be paid for at the contract price for “Mobilization for .....” The Contractor will be eligible to receive the contract price for each type of Mobilization once per each airport where applicable work is performed under this contract after acceptance of the work by the Engineer.

\*Note: “Mobilization for Taxiway & Apron Pavement Marking” will ONLY be paid when taxiway and apron pavement marking work has been performed exclusive of any runway pavement marking work and the “Mobilization for Runway Pavement Marking” has not been paid on that particular project.\*

## **BASIS OF PAYMENT:**

Payment for "Mobilization for....." will be per each airport and will be made available after satisfactory completion of the required work under this contract at each airport.

Payment will be made under:

“Mobilization for Pavement Crack and Joint Sealing.....	Ea.”
“Mobilization for Full Depth Asphalt Pavement Patching.....	Ea.”
“Mobilization for Concrete/Asphalt Pavement Repair.....	Ea.”
“Mobilization for Emulsified Asphalt Slurry Seal-Type B.....	Ea.”
“Mobilization for Thermoplastic Coal-Tar Emulsion Slurry Seal.....	Ea.”
“Mobilization for Pavement Sealer/Rejuvenator.....	Ea.”
“Mobilization for Runway Pavement Marking.....	Ea.”
“Mobilization for Taxiway & Apron Pavement Marking*.....	Ea.”
“Mobilization for Pavement Marking Removal.....	Ea.”
“Mobilization for Pavement Marking Cleaning.....	Ea.”

# PAVEMENT CRACK AND JOINT SEALING

## **DESCRIPTION:**

The work governed by this provision consists of sealing the cracks and joints with a rubberized asphalt sealant in accordance with these specifications for the areas shown on the plans or as directed by the Engineer.

## **MATERIALS:**

### **TYPE A, Crack and Joint Sealant:**

The material used to seal the joints and cracks shall meet or exceed the following minimum specifications noted in Table 1 when tested for conformance with ASTM D6690, Type I Limits, formerly ASTM D1190:

**TABLE 1 – Type A Material Properties**

<b><u>Test</u></b>	<b><u>ASTM D6690, Type I Limits</u></b>
Cone Penetration, 77°F (25°C) (ASTM D3407)	90 max.
Flow, 140°F (60°C)	5 mm max.
Softening Point	176°F (80°C) min.
Bond, 0°F (-18°C), 50% ext.	Pass 5 cycles
Recommended Pour Temperature	380°F (193°C)
Safe Heating Temperature	410°F (210°C)
Workability	Capable of being melted and applied through a pressure feed, indirect heated, agitated melter

**TABLE 2 – Type A Material Composition**

<b><u>Composition</u></b>	<b><u>Requirement</u></b>
Recycled Rubber Content (by asphaltic components)	18% min.
Recycled Rubber Gradation (% passing)	
#10	95-100%
#20	35-55%
#40	0-25%
Unit weight @ 60°F (15.5°C)	10.0 lb/gal. Max.

### **Notes:**

1. The above specifications are those of CRAFCO product “Asphalt Rubber Plus Sealant.”
2. Other products may be available which meet or exceed these criteria and such products may be used, however, proof of conformance to criteria (Crack and Joint Sealant Material Certification Form) must be submitted with your bid.

**TYPE B, Crack and Joint Sealant:**

The material used to seal the joints and cracks shall be a fiberized asphalt sealant and shall meet the following material properties and specification limits in Tables 3 and 4 and the sealant must contain 5 +/- 1/2% by weight polyester fibers blended with high quality modified asphalt cement.

**TABLE 3: Type B, Fiber Properties**

Type	Polyester
Denier	3 to 5
Length	1/4 inch (0.6mm)
Specific Gravity	1.38
Melt Temperature	478°F to 490°F (248-254°C)
Tensile Strength	78,000 to 88,000 psi (53,708 to 60,632 N/cm <sup>2</sup> )
Elongation at Break	35-38%

**TABLE 4: Specification Limits**

<u>Property</u>	<u>Recommended Spec Limits</u>
Recommended Application Temperature	350°F (177°C)
Safe Heating Temperature	400°F (204°C)
Softening Point (ASTM D36)	210°F (99°C) min.
Flexibility, 1in, 25mm 10F(-12C), 90 deg. bend, 10 sec.	Pass @ 20°F (-7°C)
Cone Penetration, 77F (ASTM D5329)	20 max.
Ductility, 77F, 5 cm/min. (ASTM D113)	10 cm min.
Asphalt Compatability (ASTM D5329)	Pass
Workability	Capable of being melted and applied through pressure feed indirect heated, agitated melter

**Notes:**

1. The above specifications are those of CRAFCO product "Poly-Fiber, Type 4 Sealant."
2. Other products may be available which meet or exceed these criteria and such products may be used, however, proof of conformance to criteria (Crack and Joint Sealant Material Certification Form) must be submitted with your bid.

**TYPE C, Crack and Joint Sealant:**

The material used to seal the joints and cracks shall meet or exceed the following minimum specifications noted in Table 5 when tested for conformance with ASTM D6690, Type I Limits, formerly ASTM D1190:

**TABLE 5 – Type C Material Properties**

<b>Test</b>	<b>ASTM D6690, Type I Limits</b>
Cone Penetration, 77°F (25°C) (ASTM D3407)	90 max.
Flow, 140°F (60°C)	5 mm max.
Softening Point	176°F (80°C) min.
Bond, 0°F (-18°C), 50% ext.	Pass 5 cycles
Asphalt Compatibility	Pass
Recommended Pour Temperature	380°F (193°C)
Safe Heating Temperature	410°F (210°C)
Workability	Capable of being melted and applied through a pressure feed, indirect heated, agitated melter

**Notes:**

1. The above specifications are those of CRAFCO product “Roadsaver 211”
2. Other products may be available which meet or exceed these criteria and such products may be used, however, proof of conformance to criteria (Crack and Joint Sealant Material Certification Form) must be submitted with your bid.

**Herbicide/Soil Sterilant:**

The herbicide/soil sterilant must kill all vegetation residing within the pavement joints and cracks to be sealed and render the soil sterile for a period of 6 months or more. Material Safety Data Sheets for the herbicide/soil sterilant must be submitted to the Engineer prior to any application. Contractor must follow all applicable local, state, and federal laws for the handling and application of herbicide/soil sterilant. All herbicide/soil sterilant materials must be supplied in accordance with section 1060-13 of the Standard Specifications.

**EQUIPMENT:**

The Contractor shall furnish all equipment and hardware necessary for the performance of the work in accordance with these specifications.

**Melter/Applicator:**

Trailer-mounted crack seal melter kettle with a 100 gallon tank (min), capable of safely heating material to the recommended pour temperature, maintaining material at pour temperature, using the air jacketed flow method to prevent the burning of the sealant. The melter/applicator shall have a horizontally mounted full sweep agitator and a pressure feed wand system for application.

**Hot Compressed Air Lance:**

Truck or trailer mounted compressor capable of maintaining a minimum of 3,000°F in temperature and a minimum air jet force of 3,000 fps of blasting.

**Pavement Cutter/Router:**

Wheel mounted, gasoline or diesel powered, pavement cutter/router with rock deflectors and safety shut off in working order, capable of routing asphalt concrete to a width of ½ inch to ¾ inch.

**Power Broom/Vacuum Truck:**

Tractor mounted power broom or Vacuum truck capable of removing all FOD from pavement surfaces.

**Blowers:**

Backpack, handheld, or wheeled blowers capable of removing FOD from pavement surfaces.

**WEATHER LIMITATIONS:**

Do not apply pavement crack and joint sealant when pavement surface temperature is below 40°F, moisture is present on the surface of the pavement, or rain is imminent.

**CONSTRUCTION METHODS:****General:**

Install the sealant so that it forms a complete watertight bond with a high degree of elasticity, with maximum flexibility and longevity over extreme temperature ranges. Only pavement cracks and joints located in the areas shown on the plans or as designated by the Engineer shall be sealed.

Boxes of sealant are to be palletized for shipment. The pallets are to be protected with a weatherproof covering. The Contractor shall be responsible for storage, clean up, and all trash disposal.

**Crack Preparation:**

**Herbicide/Soil Sterilant:** A minimum of ten (10) days and a maximum of thirty (30) days before any routing and sealing, all vegetation in the pavement cracks and joints to be sealed shall be treated with an approved herbicide/soil sterilant. The herbicide/soil sterilant must be placed on the cracks at the rate and methods recommended by the manufacturer. All herbicide/soil sterilant use must be in accordance with section 1060-13 of the Standard Specifications. Temporary dye must be added to the herbicide/soil sterilant solution to identify the locations of application.

**Routing:** All cracks are to be routed according to Table 6 below. All routed cracks should have a reservoir of ½ inch, never to exceed ¾ inch.

**Hot Compressed Air Lance:** A hot compressed air (HCA) lance shall be used at all times to blast out any vegetation, dirt, dampness, and loose materials from the cracks to be sealed. Compressed air without heat may be used at times if approved by the Engineer.

**Application:**

All cracks and joints are to be cleaned and sealed with the specified crack sealant material in accordance with the criteria included in Table 6.

**TABLE 6 - Crack Sealing Criteria for Differing Crack Widths**

<b>Crack Width</b>	<b>Action</b>
Less than 1/16 inch	Do not seal.
Greater than 1/16 inch & Less than ½ inch	Route, clean, and seal. Only route if cracks are reasonably straight and are capable of being routed without excessively damaging the existing pavement.
Greater than ½ inch & Less than 2 inches	Do not route. Clean and Seal.
Greater than 2 inches	Do nothing.

\*\*\*Note: The Engineer must approve any exceptions to these criteria. \*\*\*

Sealant shall be applied in the prepared cracks at a temperature range of 350°F minimum and 390°F maximum, using the pressure screed shoe to completely fill the crack, leaving a maximum overband width of 2-inches. Immediately after the crack has been filled, a squeegee or other acceptable tool must be used to strike off any excessive material on the surface. Excessive overbanding or waste of sealant materials will not be tolerated.

All cracks sealed shall have a minimum of 1/2-inch depth of sealant installed. Traffic shall not be permitted over the sealed cracks without the approval of the Engineer.

For further instructions, see the Crack Sealing Details included in this contract for specifics on routing and sealant dimensions.

**Cleanup/FOD Removal:**

**ALL** debris and dirt that is generated from the routing and cleaning of the cracks and joints are to be cleaned off the pavements once the cracks have been properly sealed. All pavement areas being sealed shall be left clean and free of loose debris and dirt resulting from the Contractor's operations and work before being opened to traffic. No areas of pavement shall be left unclean overnight unless approved by the Engineer.



**METHOD OF MEASUREMENT:**

The amount of the sealant material to be paid for will be the actual number of pounds of material that has satisfactorily been used to seal pavement cracks in accordance with these specifications and designated locations as shown in this contract or provided by the Engineer. Any material that has been spilled, used in excessive overbanding, used in cracks cleaned to a depth greater than 3/4-inch, wasted, misapplied, or unsatisfactorily used in any way will be deducted in determining quantities for payment. The Engineer will determine the quantity, if any, to be deducted. The Engineer's decision on the quantity to be deducted will be final and binding.

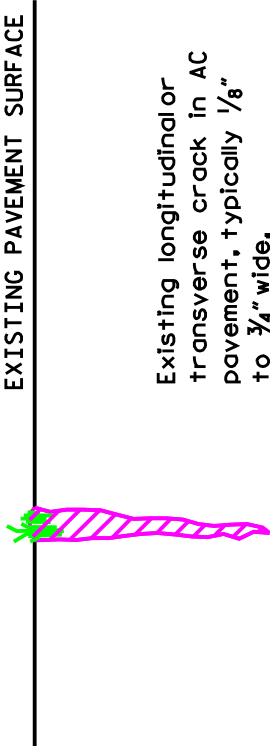
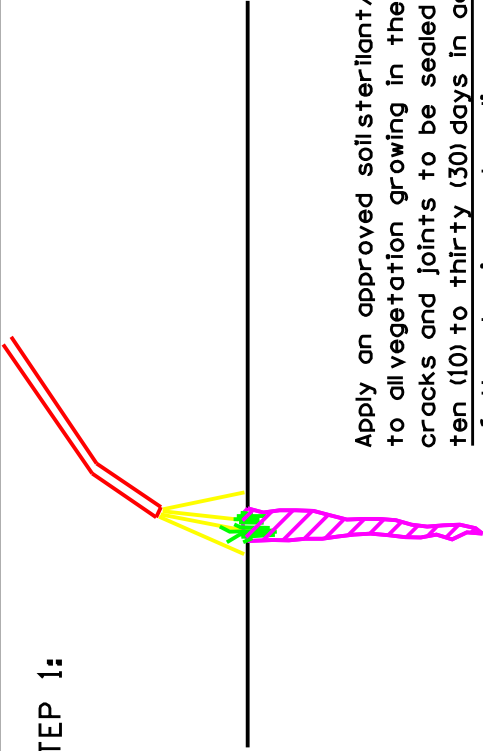
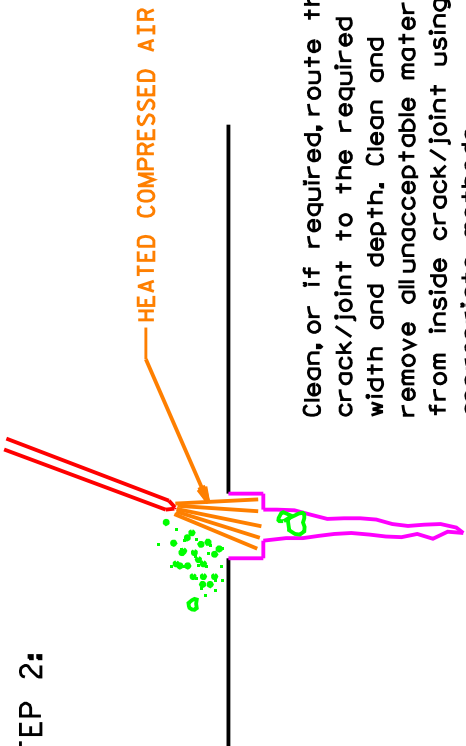
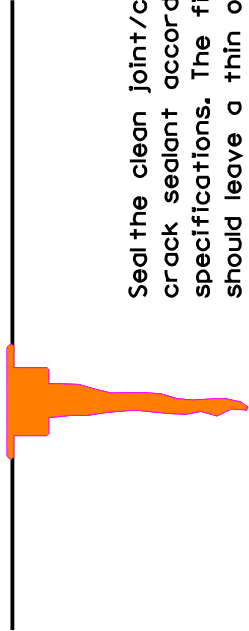
**BASIS OF PAYMENT:**

The quantity of sealant material, measured as above, will be paid for at the contract unit price per pound. The above price and payment will be full compensation for all work required to seal the pavement cracks including but not limited to furnishing, hauling, loading, and unloading, and storage of all needed materials; application of herbicide, routing, cleaning and preparation of cracks to be sealed; application of an approved soil sterilant, application of the approved sealant material in the prepared cracks, clean-up, and any incidentals necessary to satisfactorily complete the work.

Payment will be made under:

- "Pavement Crack and Joint Sealing, Type A (0-2,000 Lbs./Airport) .....Lbs"
- "Pavement Crack and Joint Sealing, Type A (Greater than 2,000 Lbs./Airport) .....Lbs"
- "Pavement Crack and Joint Sealing, Type B (0-2,000 Lbs./Airport) .....Lbs"
- "Pavement Crack and Joint Sealing, Type B (Greater than 2,000 Lbs./Airport) .....Lbs"
- "Pavement Crack and Joint Sealing, Type C (0-2,000 Lbs./Airport) .....Lbs"
- "Pavement Crack and Joint Sealing, Type C (Greater than 2,000 Lbs./Airport) .....Lbs"

# PAVEMENT CRACK AND JOINT SEALING PROCEDURE

<p>EXISTING PAVEMENT SURFACE</p>  <p>Existing longitudinal or transverse crack in AC pavement, typically 1/8" to 3/4" wide.</p>	<p>STEP 1:</p>  <p>Apply an approved soil sterilant/herbicide to all vegetation growing in the cracks and joints to be sealed <u>ten (10) to thirty (30) days in advance of the cleaning and sealing operation.</u></p>
<p>STEP 2:</p>  <p>Clean, or if required, route the crack/joint to the required width and depth. Clean and remove all unacceptable material from inside crack/joint using appropriate methods. There should not be the presence of any moisture, dust, and loose incompressible material.</p>	<p>STEP 3:</p>  <p>Seal the clean joint/crack with crack sealant according to specifications. The final seal should leave a thin overband completely covering both edges of the joint/crack.</p>

# **FULL DEPTH ASPHALT PAVEMENT PATCHING**

## **DESCRIPTION:**

The Contractor shall repair the existing pavement in designated areas chosen by the Engineer with full depth asphalt patching. This work shall consist of removing the existing material below the existing finished grade, compacting the subgrade, and placing and compacting bituminous material in the excavated area.

## **MATERIAL:**

The type of plant mix material must be in accordance with the pavement detail contained in this contract, except where the Engineer permits the substitution of another type of approved plant mix. The asphalt concrete base course shall be the Superpave base course mix, B 25.0B, and the asphalt concrete surface course shall be Superpave S-9.5B mix.

## **EQUIPMENT:**

The Contractor shall provide all equipment necessary to remove and dispose of existing pavement materials, compact subgrade, transport, place, and compact new asphalt concrete according to the following specifications.

## **WEATHER LIMITATIONS:**

The air temperature forty-eight (48) continuous hours prior to paving must be above 32°F. All paving operations shall be in accordance with Subarticle 610-4 of the Standard Specifications. The Contractor shall not begin pavement removal if rain is imminent.

## **CONSTRUCTION METHODS:**

The Contractor shall repair the existing pavement in designated areas with full depth asphalt patching as directed by the Engineer. This patching shall include, but is not limited to, the cutting of the existing pavement to a neat vertical joint and uniform line; the removal and disposal of pavement, base, and subgrade material to a depth as shown on the plans or as determined by the Engineer below the existing finished grade; the compaction of the subgrade; the coating of the area to be repaired with a tack coat; and the replacement of the removed material with asphalt plant mix. (See detail) The existing pavement shall be removed in accordance with Section 250 of the Standard Specifications.

Asphalt concrete base course, Superpave B 25.0B, shall be placed in lifts not less than 3 inches compacted and not to exceed 5.5 inches compacted. Asphalt concrete surface course, Superpave S-9.5B, shall be placed in lifts not less than 1.5 inches compacted and not to exceed 2 inches compacted. Compaction equipment suitable for compacting patches as small as 3.5-feet by 6-feet shall be utilized on each lift. Compaction pattern to achieve proper compaction shall be approved by the Engineer.

All joints and other patch surfaces shall be checked using a 10-foot non-mobile straightedge and the variation of the surface from the straightedge shall not exceed 1/4 inch between any two contact points on the runway and shall not exceed 1/2 inch between any two contact points on taxiways and aprons. The 10-foot straightedge is furnished by the Contractor and must be used by both the Contractor and the DOT inspector to assure that the surface at joints and all other pavement patch surfaces meet this requirement. The patching operation shall not begin until this 10-foot straightedge is on hand at the patching site. Skin patches will not be accepted.

The Contractor shall schedule his operations so that all areas where pavement has been removed will be repaired on the same day of the pavement removal.

For further instructions, see the Full Depth Asphalt Pavement Patching Details included in this contract for specifics on patching dimensions.

**METHODS OF MEASUREMENT:**

The quantity of full depth asphalt patching to be paid for will be the actual number of tons of asphalt plant mix, complete in place, which has been used to make complete and accepted repairs, except for those repairs that have been made necessary by the Contractor's negligence. The asphalt plant mixed material will be measured by being weighed in trucks on certified platform scales or other certified weighing devices.

**BASIS OF PAYMENT:**

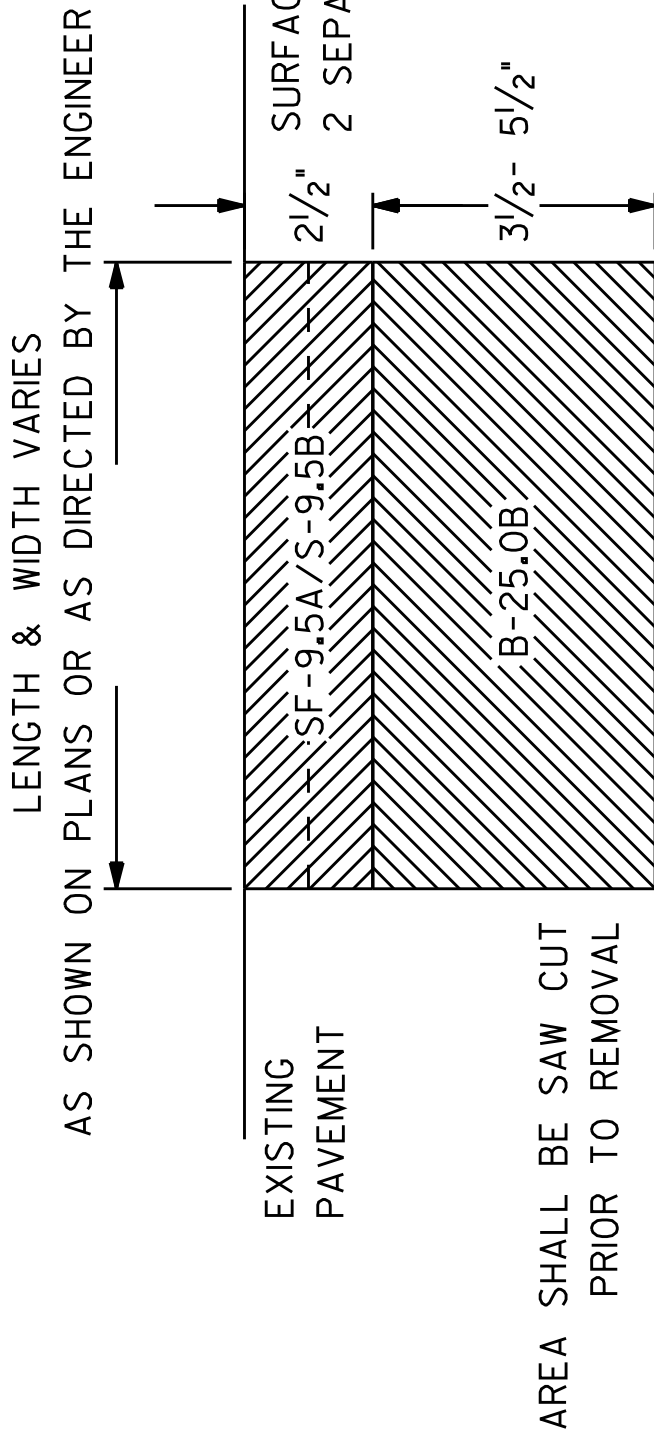
Payment for the item "Full Depth Asphalt Patching" shall be compensation for all work covered by this provision, including but not limited to excavation and compaction of repair areas; removal and disposal of the existing pavement and base material; furnishing and applying tack coat; and furnishing, placing, and compacting bituminous material.

Payment will be made under:

“Full Depth Asphalt Patching (0-50 tons/airport) .....tons”

“Full Depth Asphalt Patching (Greater than 50 tons/airport) .....tons”

# FULL DEPTH ASPHALT PAVEMENT PATCHING



TACK ALL NEWLY CUT VERTICAL PAVEMENT  
EDGES WITH APPROVED LIQUID ASPHALT TACK  
COAT IN ACCORDANCE WITH ARTICLE 605-2

# CONCRETE/ASPHALT PAVEMENT REPAIR

## **DESCRIPTION:**

The work governed by this provision consists of repairing large cracks, joints, spalls, and small potholes using a hot-applied, flexible, concrete/asphalt repair material in accordance with these specifications for the areas shown on the plans or as directed by the Engineer.

## **MATERIALS:**

**TABLE 1 – Material Properties**

<b>Binder Properties</b>	<b>Test Method</b>	<b>Requirement</b>
Bond	ASTM D 1190	Pass, 3 cycles @ -20°C, 50%
Penetration	ASTM D 5329	1 mm min @ -18°C, 200 g, 60 sec 9 mm max @ 25°C, 150 g, 5 sec
Ductility	ASTM D113	40 cm min @ 25°C
Flexibility	ASTM D5329	Pass @ -12°C
Flow	ASTM D5329	3 mm max @ 60° @ 5 hours
Resilience	ASTM D5329	40% min @ 25°C
Softening Point	ASTM D36	82°C min
Elongation		500% min
Wheel tracking@ 122°F	BS598	4.8mm/h
Safe Heating Temperature		230°C (440°F)
Recommended Pouring Temperature		185°C to 199°C (365°F-390°F)

## **Notes:**

1. The above material properties are those of Fibrecrete. Fibrecrete is a hot-applied mastic asphalt binder with 36% bitumen content, polymers mixed with graded fillers, recycled steel fibers, aggregate, and recycled tire rubber. Other products may be available which meet or exceed these criteria and such products may be used, however, proof of conformance to the above criteria is required.
2. Each shipment of the concrete/asphalt repair material shall be accompanied by Material Safety Data Sheets (MSDS) and a Certificate of Compliance certifying that the materials conform to the requirements this specification.
3. All of the concrete/asphalt repair materials shall be delivered unopened in their original containers bearing the manufacturer's label, specifying date of manufacture, batch number, trade name brand, and quantity.

4. Sufficient material to perform the entire crack or spall repair application shall be in storage at the site prior to any field preparation, so that there shall be no delay in procuring the material for each days application.

#### **EQUIPMENT:**

The Contractor shall provide all equipment necessary to remove, clean, and prepare the failing concrete/asphalt, place the concrete/asphalt repair material according to the manufacturer's installation requirements at all locations identified in the plans or as directed by the Engineer. The Contractor shall also provide the necessary equipment for removing all debris on the airfield generated from this work.

#### **WEATHER LIMITATIONS:**

Do not apply the concrete/asphalt repair material when pavement surface temperature is below 40°F, moisture is present on the surface of the pavement, or rain is imminent.

#### **CONSTRUCTION METHODS:**

##### **Surface Preparation:**

The Contractor shall prepare areas by removing any loose debris using a pavement breaker, a mechanical planer, or as directed by the Engineer. When using a planer, the surface is milled out to a width and depth as directed by the Engineer. The recess is then cleaned and dried using hot compressed air to thoroughly prepare the surface, removing all debris, loose material, and/or other deleterious substances that may hamper the product's ability to adhere to the faces of the repair area.

##### **Installation:**

The concrete/asphalt repair material will be heated in a thermostatically controlled mixer, having a horizontal agitator that ensures complete mixing. Once the material has reached approximately 300°F, the molten concrete/asphalt repair material will be introduced into the prepared repair area, sealing the bottom of the repair from water intrusion. For depths greater than 1 inch heated ¾" granite aggregate shall be added at a rate of 25% - 35% by volume. The final ¾" of the repair will be the concrete/asphalt repair material for optimum flexibility of the repair. Once this top layer has been screeded to a level grade, a high PSV aggregate will be applied to the top of the repair to ensure proper skid resistance. The concrete/asphalt repair material shall be ready for traffic within 1 hour.

**METHOD OF MEASUREMENT:**

The amount of the concrete/asphalt repair material to be paid for will be the actual number of pounds of material that has satisfactorily been used to repair concrete/asphalt pavement distresses in accordance with these specifications and at designated locations as shown in this contract or provided by the Engineer. Any material that has been spilled, used in excessive overlap, wasted, misapplied, or unsatisfactorily used in any way will be deducted in determining quantities for payment. The Engineer will determine the quantity, if any, to be deducted. The Engineer's decision on the quantity to be deducted will be final and binding.

**BASIS OF PAYMENT:**

The quantity of concrete/asphalt repair material, measured as above, will be paid for at the contract unit price per pound. The above price and payment will be full compensation for all work required to repair the pavement distresses including but not limited to furnishing, hauling, loading, and unloading, and storage of all needed materials; application of, cleaning and preparation of distresses to be repaired; application of the approved concrete/asphalt repair material in the prepared distresses, clean-up, and any incidentals necessary to satisfactorily complete the work.

Payment will be made under:

“Concrete/Asphalt Repair, (0-2,000 Lbs./Airport) .....Lbs”

“Concrete/Asphalt Repair, (Greater than 2,000 Lbs./Airport).....Lbs”



# EMULSIFIED ASPHALT SLURRY SEAL

## **DESCRIPTION:**

This work shall consist of furnishing and applying an emulsified asphalt slurry seal. The slurry seal shall consist of a mixture of an approved emulsified asphalt, mineral aggregate, water and specified additives, properly proportioned, mixed and uniformly spread over a prepared surface as specified herein and in accordance with the specifications. The cured slurry seal shall have a homogeneous appearance, adhere firmly to the surface and have a skid resistant texture.

## **MATERIALS:**

### **Aggregate and Composition:**

The quality of aggregates shall be crushed stone meeting the requirements of ASTM D692 and shall conform to the requirements of Section 1012 of the Specification. The aggregate shall be proportioned to produce a uniform gradation meeting the requirements of Table I. The aggregate shall have a minimum sand equivalent of 45 as specified by AASHTO T176.

**Table I -Job Mix Range**

<b><u>Type Sieve Size</u></b>	<b><u>Percent Passing</u></b>
#3/8	100
#4	90-100
#8	65-90
#16	45-70
#30	30-50
#50	18-33
#100	10-21
#200	5-15
Design Asphalt Content, Percent	7.0-12.0%

The percent of residual asphalt based on the weight of the dry aggregate shall be within the range specified in Table I. The tolerance for the residual asphalt content will be +/- 1.00%.

The aggregate gradation and percent residual asphalt, as provided in the slurry seal design accepted by the Engineer, shall be maintained within the tolerance specified.

The aggregate shall be pre-wet with a minimum amount of water prior to blending with the emulsified asphalt to obtain a fluid, homogeneous slurry mixture of the proper consistency. No additional water above that quantity required by the slurry seal job mix formula shall be added to the slurry mix in order to obtain a more workable mixture.

Mineral Filler shall be portland cement or hydrated lime which respectively meet the requirements of Section 1012-1 of the Specifications.

**Bituminous Material:**

The emulsified asphalt for a Quick-Set Emulsified Asphalt Slurry Seal shall be Type CQS-1h meeting the requirements for Type CSS-1h with the following exceptions:

<b>Residue %</b>	63 minimum
<b>Cement Mixing Test %</b>	(waived)

Unless otherwise specified, a quick-set emulsified asphalt slurry seal shall be utilized.

**Water:**

The water used in the mix shall conform to the requirements of Section 1024-4 of the Specifications.

**Slurry Seal Job Mix Formula:**

The Contractor shall submit a signed original of a mix design covering the specific materials to be used on the project to the Materials and Tests Unit for acceptance together with representative samples of each component of the slurry seal mix. The samples shall contain information relative to the sources, type of materials, and project number.

The design must be performed by a qualified laboratory. Once the materials are approved, no substitution will be permitted unless first tested and approved by the laboratory preparing the mix design. No slurry seal work shall begin nor will any mixture be accepted until the Materials and Tests Unit has evaluated the slurry seal mix design and approved the design as the Job Mix Formula for the project.

The Laboratory report will show the results of tests performed on individual materials, comparing their values to those required by this specification. Job aggregates will be used in ISSA T102. Mixing tests must pass at the maximum expected air temperature in T115, compatibility. The report will provide the following information on the slurry seal mixture.

**Quick-Set Emulsified Asphalt Slurry Seal**

Mixing Time Test, seconds @ 77 deg. E (T102)	120 minimum
Set time tests	
30 Minute Blotter Test (T102)	no brown stain
Displacement Test	no displacement
Water Resistance Test @ 30 minutes (T102)	no discoloration
Wet Stripping Test % coating (T114)	90% minimum
System Compatibility (T115)	Pass
Set Time Tests: 30 minutes (T139)	12 kg-cm minimum
Early Rolling Traffic Time: 2 hours	20 kg-cm minimum
Wet Track Abrasion Test, Loss in grams per square foot (T100)	75 maximum

## **EQUIPMENT:**

All equipment necessary for the satisfactory performance of this work shall be on hand and approved before the work is permitted to begin. All equipment, tools, and machines used in the performance of this work shall be maintained in satisfactory working condition.

### **Mixing Equipment:**

The paving mixture shall be produced in a self-propelled, front feed, continuous loading, mixing machine equipped with a positive, non-slipping aggregate delivery system and an interconnected, positive displacement waterjacketed gear pump to accurately proportion ingredients.

The mixing machine shall be equipped with an approved fines feeder that has an accurate metering device or method to introduce a predetermined amount of mineral filler into the mixer at the same time and location as the mineral aggregate. A spray bar shall be provided to completely wet the aggregate dropping down to the pugmill with additive and water. The emulsion shall be introduced above the third point of the additive and water when the modified emulsified asphalt is added. Blade size and side clearances shall meet the equipment manufacturer's recommendations.

Mixing shall be done in a manner that does not cause premature breaking of the emulsified asphalt. The mixing unit of the mixing chamber shall be capable of thoroughly blending all ingredients.

The mixer shall be equipped with a remote forward speed control at the back of the mixing platform so the rear operator can control forward speed and level of mixture in the paving or rut-fill spreader box. The Contractor shall provide material control devices that are readily accessible and positioned so the amount of each material used can be determined at any time. Each material control device shall be calibrated prior to each mix application and as required by the Engineer.

The mixing machine shall be equipped with a water pressure system and fog type spray bar, adequate for compete fogging of the surface preceding spreading equipment of the slurry mixture.

The mixing machine shall include controls for proportioning and calibrating the aggregate feed. The aggregate feed device shall be equipped with a revolution counter so that the amount of aggregate used may be determined at any time and shall have a positive locking feed gate.

The emulsion pump shall be of the positive displacement type and shall be equipped with meter so that the amount of emulsion used may be determined at any time. The emulsion pump, meter and piping shall be arranged to afford a means to calibrate the meter by weighing a metered volume. The pump shall deliver the asphalt to the mixer box at a uniform rate, which shall not vary more than two percent from the required quantity.

The water pump shall be equipped with a minimum of two valves. One valve shall establish the required water flow. The other valve shall be a quick acting valve to start and stop the water flow.

The mixing machine shall have sight gauges located at the material storage tanks for the asphalt emulsion and water.

The mixing machine shall be equipped with approved metering devices so that it can be accurately calibrated and the quantities of materials used during any one period can be closely estimated. In the event that the metering devices stop working properly, the mixing machine shall no longer be used until necessary repairs have been made.

Satisfactory means shall be provided to afford positive interlocking control between the flow of aggregate from the bins and the flow of emulsion from the pump. Each slurry-mixing unit to be used in the performance of the work shall be calibrated in the presence of the Engineer prior to construction. The documentation shall include an individual calibration of each material at various settings, which can be related to the machine's metering devices. No machine will be allowed to work on the project until the calibration has been completed and accepted.

### **Spreading Equipment:**

Attached to the machine shall be a mechanical type spreader box with a positive screed adjustment for yield control, and a positive adjustment for the joint matcher. The box shall be attached to the mixer, equipped with welded paddles mounted on a solid adjustable shaft, not less than 1 1/2 inches in diameter at the outer bearings to alter the auger height and continually agitate and distribute the materials throughout the box. The box shall be equipped with curb bumpers and replaceable runners with a minimum of 5 1/2-foot long end runners. The box shall be equipped with a sufficient walkway to provide access to either side of the spreader box without walking through the freshly laid material. The equipment shall provide sufficient turbulence to prevent the mix from setting in the box or causing excessive side build-up or lumps. To prevent the loss of the mixture, the Contractor shall attach flexible seals, front and rear, in contact with the road. Rut filling will require a steel strike-off on the spreading equipment or the use of a rut-box. A rut-box shall be used for filling ruts in excess of 1/2 inch unless otherwise specified by the Engineer. The Contractor shall operate the spreading equipment in such a manner to prevent the loss of the mixture on super-elevated curves. Mixture shall be spread to fill cracks and minor surface irregularities and achieve a uniform skid-resistant surface without causing skips, lumps or tears in the finished mat.

Use of burlap drags or other drags necessary to obtain the desired finish shall be approved by the Engineer. Drags having excessive build-up shall be replaced. Drags shall be kept in a completely flexible condition at all times.

Power brooms, power blowers, air compressors, water flushing equipment and hand brooms shall be capable of thoroughly cleaning all cracks and the old surface. Hand squeegees, hand brooms, shovels and other incidental equipment shall be provided as necessary to perform the work.

### **WEATHER LIMITATIONS:**

Slurry seal shall not be applied if either the pavement or air temperature is less than 55 degrees Fahrenheit for quick-set or quick-traffic slurry seal or less than 70 degrees Fahrenheit for slow-set slurry seal.

No slurry seal shall be applied when there is danger that the finished product will freeze during the following 24 hour period.

### **CONSTRUCTION METHODS:**

The Contractor shall notify the Engineer at least three (3) working days prior to beginning work. The Contractor shall place a test strip for approval by the Engineer prior to beginning work.

#### **Preparation of Existing Surface:**

Immediately prior to applying the tack coat and slurry seal, all dust, dirt, vegetation and other deleterious material shall be removed from the existing surface by brooming, washing with water under high pressure, blowing with compressed air or other approved methods. The cleaned surface shall be approved prior to application of the tack coat and slurry seal.

#### **Tack Coat and Distributor:**

A tack coat consisting of one part emulsified asphalt and three parts water shall be applied to all pavements receiving a slurry application. The emulsified asphalt may be the same as that used in the mix. Pressure distributors used for the application of the diluted emulsion tack coat shall be self propelled, equipped with pneumatic tires, and capable of uniformly applying 0.05 to 0.10 gallons per square yard of the diluted emulsion over the required width of the application. Distributors shall be equipped with tachometers, pressure gauges, and volume measuring devices. The tack coat shall be applied at least two hours before the slurry, but within the same day. No separate payment will be made for tack coat, as it shall be considered incidental to this pay item, "Emulsified Asphalt Slurry Seal".

#### **Application:**

The emulsified asphalt slurry seal, unless otherwise specified, shall be applied at a rate of 16 pounds per square yard based on dry aggregate weight for the slurry seal.

Unless otherwise directed by the Engineer, the surface shall be pre-wet with water by fogging ahead of the slurry box. Pre-wetting shall be closely controlled to prevent accumulation of water to the point of running off or collecting.

The Contractor may request approval to use truck mounted spreading equipment. Request shall be made in writing to the Engineer, who shall have full authority to approve or deny the use of truck mounted equipment.

Immediately before loading the aggregate into the slurry seal mixing machine, the aggregate shall be given a final screening by sieving it through screening equipment capable of removing any random oversized material. The slurry mixture shall be of the desired consistency when deposited on the surface after which no additional elements shall be added. Total time of mixing shall not exceed four minutes. A sufficient amount of slurry seal will be carried in all parts of the spreader at all times so that complete coverage is obtained. No lumping, balling, or unmixed aggregate shall be permitted. No segregation of the emulsion and aggregate fines from the coarse aggregate will be permitted. If the coarse aggregate settles to the bottom of the mix, the slurry will be removed from the pavement. A clearly visible, well-defined “rolling” action of the slurry shall be present across the full length of the spreader box. The slurry shall have proper consistency so that excessive spattering and excessive free water is avoided. The slurry consistency shall not vary more than +/- 0.5 cm from the slurry seal design after field adjustments. The spraying of water into the spreader box during laydown operations will not be permitted. Band tools, lutes and squeegees shall be used to spread slurry on areas not accessible to the machine spreading equipment. The Contractor shall be responsible for clean up of any dislodged aggregates from the slurry for a period of thirty (30) days after placement of the slurry. Cleanup may include sweeping and or use of a vacuum system.

#### **Joints:**

No excessive build-up, uncovered areas or unsightly appearance shall be permitted on longitudinal or transverse joints. An excessive overlay will be permitted on longitudinal joints. The Contractor shall provide suitable width spreading equipment to produce a minimum number of longitudinal joints throughout the project. When possible, longitudinal joints shall be placed on lane lines. Half passes and odd width passes will be used only in minimum amounts. If half passes are used, they shall not be the last pass of any paved area.

#### **Lines:**

Care shall be taken to insure straight lines along curbs and shoulders. No runoff on these areas will be permitted. Lines at intersections will be kept straight to provide a good appearance.

#### **Rolling:**

The slurry seal application shall be rolled with a pneumatic tire roller as soon as the surface will accept the roller without tearing or the damaging the surface. A minimum of three successive coverages of the entire slurry sealed area is required. The use of rollers, which result in excessive crushing of the pavement aggregate, shall not be permitted. Rollers shall be configured to prevent picking up the material.

#### **Protection:**

Traffic shall not be allowed on the slurry seal until it has cured sufficiently to prevent pickup by vehicle tires. The Contractor shall maintain traffic control as necessary to prevent damage to the slurry seal. Any damage done by traffic to the slurry shall be repaired by the Contractor at no expense to the Department.

**Responsibility:**

The production process of the slurry seal operation requires the Contractor to have full responsibility for the placement of acceptable slurry seal.

**METHOD OF MEASUREMENT:**

Emulsified Asphalt Slurry Seal will be measured by the actual number of square yards placed in accordance with this specification.

**BASIS OF PAYMENT:**

The accepted quantities of emulsified asphalt slurry seal will be paid for at the contract unit price per square yard for the type of slurry seal specified.

The unit prices shown in the contract shall be full compensation for all material, labor, tools, equipment, maintenance of traffic, and all other incidentals necessary to complete the work.

Payment will be made under:

Emulsified Asphalt Slurry Seal

Square Yard

# THERMOPLASTIC COAL-TAR EMULSION SLURRY SEAL

## **DESCRIPTION:**

This item shall consist of an application of a thermoplastic resin coal-tar emulsion slurry seal, with mineral aggregate, applied on an existing, previously prepared asphalt surface, in accordance with these specifications.

## **MATERIALS:**

### **Aggregate:**

The aggregate shall consist of sound, durable crushed igneous type stone (crushed basalt, granite, trap rock, etc.) with a hardness greater than 5 on the MOH hardness scale and shall show no more wear than thirty five percent (35%) when tested in accordance with ASTM C131. The aggregate shall be free from coatings of clay, organic matter, and other deleterious materials and shall meet the gradation in Table 1 when tested in accordance with ASTM C136.

The Contractor shall submit samples of aggregates at least fourteen (14) days prior to the start of production. During production, the sampling points and intervals will be designated by the Engineer. The samples will be the basis of approval from the standpoint of the quality requirements of this section.

**Table 1: Gradation of Aggregates**

<b>Sieve Size</b>	<b>Percentage By Weight Passing Sieves</b>
No. 8	100
No. 16	80-90
No. 30	40-60
No. 50	25-40
No. 100	10-20
No. 200	10-20

### **Binder Materials:**

The emulsion material shall be a thermoplastic coal tar emulsion made up of plastic resin and emulsified coal-tar pitch conforming to the requirements of ASTM D 3320. The thermoplastic coal-tar emulsion shall be manufactured as a complete product, which can be tested at the manufacturing plant. The water content of the emulsion shall not exceed forty-eight percent (48%) +/- 1%, when tested in accordance with ASTM D 244, paragraph 3. A dried film of emulsion shall contain a minimum of eighty-nine percent (89%) of a combination of plastic resin and coal-tar with the remaining percentage being inorganic filler. The dried emulsion shall have a softening point greater than 212°F when tested in accordance with ASTM D36. A film of the dried emulsion material, 8-mils thick, shall stretch to 5 times its original length at 70°F without breaking, and recover thirty-five percent (35%) of this length in one minute.



**Water:**

The Contractor is responsible for obtaining the water used in mixing and it shall be potable and free from soluble salts.

**Composition:**

The aggregate shall be mixed with the thermoplastic coal-tar emulsion at the rate of 21-24 pounds per gallon of emulsion into a homogeneous slurry mixture.

**WEATHER LIMITATIONS:**

The slurry seal shall be applied only when the surface is dry and the air temperature is above 50° F. It should not be applied when the humidity or impending weather conditions will not allow proper curing.

**EQUIPMENT:**

Descriptive information on the mixing and applying equipment to be used shall be submitted to the Engineer not less than ten (10) days before work starts. All methods employed in performing the work and all equipment, tools, and machinery used for handling materials and executing any part of the work shall be subject to the approval of the Engineer before the work is started.

**Slurry Machine:**

The slurry machine shall be a truck-mounted mobile mixing plant with a towed-type spreader box. It shall have a water tank and water pump capable of delivering a constant volume of water.

The slurry machine shall have an agitated storage tank for the thermoplastic emulsion and a non-shearing peristaltic pump with variable rate of flow for the delivery of this material. The slurry machine shall have a hopper for holding aggregate, supplying this material to the mixing chamber by a conveyor belt. The rate of aggregate delivery shall be volumetrically controlled by an adjustable gate opening. The speed of the conveyor shall be mechanically dependent upon the speed of the peristaltic pump.

The machine shall be equipped with a water spray bar capable of fogging the pavement surface with up to 0.05 gallons of water per square yard. Over spraying the pavement with water creating ponding or standing water will not be tolerated.

**Batch-Mixing Machine:**

The batch-mixing machine shall be a truck-mounted 500 to 1,000 gallon tank containing suitably-driven mixing blades to combine predetermined quantities of thermoplastic emulsion, aggregate, and, if necessary water into a homogeneous slurry. It shall be equipped with a water tank and pump capable of delivering a constant volume of water to a spray bar. The spray bar shall be capable of fogging the pavement surface with up to 0.05 gallons of water per square yard.

**Spreading Equipment:**

Attached to the mixing machine shall be a mechanical-type squeegee distributor, equipped with flexible material in contact with the surface to prevent loss of slurry from the distributor. It shall be maintained to prevent loss of slurry on varying grades and adjusted to assure uniform spread. There shall be a lateral control device and a flexible strike-off capable of being adjusted to lay the slurry at the specified rate of application. The spreader box shall have an adjustable width. The box shall be kept clean; dried slurry build-up on the box shall not be permitted.

**Auxiliary Equipment:**

Other tools or equipment such as power brooms, power blowers, air compressors, hand brooms, hand squeegees, etc. shall be provided as necessary by the Contractor to meet this specification.

**CONSTRUCTION METHODS:****Surface Preparation:**

Prior to placing the slurry seal, unsatisfactory areas shall be repaired and the surface shall be cleaned of dust, dirt or other loose foreign matter. Any standard cleaning method will be acceptable except water flushing. Removal of all vegetation growing in and through the pavement with compressed heated air (hot air lance) will be required prior to placement of the slurry. Cleaning and removal of overlapping vegetation along the edge of pavement will be required and may be accomplished by mowing and brooming as needed to expose the full pavement section. Pavement markings lacking adequate pavement profile (roughness for bonding) on the surface to be treated shall be prepared as necessary to achieve proper bonding of the seal to the painted surface, before applying the slurry seal. Pavement marking removal/profiling shall minimize removal thickness to obtain paint obliteration and shall not result in a depression in the final slurry surface profile. All pavement areas that have existing paint on them are not to be treated with the slurry seal until approved by the Engineer.

Small oil spots are to be treated by scraping off excess oil, heating with a torch, brushing loosened material away and primed with a solution containing one-part water and one-part thermoplastic emulsion.

When large oil or grease soiled areas are present, the area shall be cleaned of the contaminants by chemical or mechanical abrasion.

All oil spot areas shall be prime sealed with thermoplastic coal-tar emulsion diluted with fifty percent water applied to the areas at the rate of 0.10 gallons per square yard.

#### **Application of Tack/Prime Coat:**

Following preparation of the pavement, a tack/prime coat of thermoplastic coal tar emulsion diluted with 50 percent (50%) water shall be applied to the pavement at the rate of 0.05 gallons per square yard.

#### **Application of Slurry Seal:**

The thermoplastic emulsion slurry seal shall be applied in one coat at an application rate 7-8 pounds of slurry per square yard.

The surface shall be pre-wet by fogging ahead of the spreader box. Water used in pre-wetting the surface shall be applied at such a rate that the entire surface is damp with no apparent flowing water in front of the spreader box. The mixture shall be of the desired consistency when deposited on the surface, and no additional elements shall be added. A sufficient amount of mixture shall be carried in the spreader box at all times so that even distribution is obtained. No clumped or unmixed aggregate shall be permitted. No segregation of the emulsion and aggregate fines from the coarse aggregate will be permitted. If the coarse aggregate settles to the bottom of the slurry, the applied slurry will be removed from the pavement surface.

Upon completion of the work, the slurry shall have no pinholes, bare spots or cracks through which liquids or foreign matter could penetrate to the underlying pavement. No excessive buildup, uncovered aggregate, or unsightly appearance shall be permitted on longitudinal or transverse joints. The finished surface shall present a uniform texture. In areas where the spreader box cannot be used, the slurry shall be applied by means of a hand squeegee.

#### **Test Section:**

Prior to full production, the Contractor shall prepare a quantity of mixture sufficient to place a test section of approximately 16-feet wide by 100-feet long at the application rate specified in the above paragraph entitled "Application of Slurry Seal." The area to be tested will be designated by the Engineer and will be located on the existing pavement. A Tack/Prime coat, the slurry seal, and any additional sealer should be placed in this area to fully represent the work to be performed under this specification.

The test section should be used to verify the adequacy of the mixture and to determine the exact application rate. The same equipment and method of operations shall be used on the test section as will be used on the remainder of the work. If the test section should prove to be unsatisfactory, the necessary adjustments to the mix composition, application rate, placement operations and equipment shall be made until the requirements of the specification are met as directed by the Engineer. Additional test sections shall be placed and evaluated if required.

### **Curing:**

The slurry shall be permitted to dry a minimum of twenty-four (24) hours before any vehicular or construction traffic will be allowed on the slurry surface and shall be sufficiently cured to prevent damage to the slurry seal. Any damage done by traffic to the slurry shall be repaired by the Contractor at no expense to the Department.

### **Skid Resistance:**

**Runway Surfaces:** The runway pavement surfaces treated with the slurry seal may be tested for skid resistance a minimum of forty-eight (48) hours after application. The results of the skid tests must be equal or greater than the Maintenance Planning skid values provided in TABLE 3-2, FRICTION LEVEL CLASSIFICATION FOR RUNWAY PAVEMENT SURFACES, in AC 150/5320-12, *Measurement, Construction, and Maintenance of Skid-resistant Airport Pavement Surfaces*, Table 3-2, (or current version) when tested at the speed of 40 mph with approved continuous friction measuring equipment [CFME].

**Taxiway and Apron Surfaces:** The skid resistance for taxiway and apron surfaces may be inspected by the Contractor and Engineer a minimum of forty-eight (48) hours after application of the slurry seal. If the Engineer determines the frictional characteristics of a section to be questionable, the section must then be tested via the approved means.

\*\*\*Note: Pavement areas tested will be along the common traffic wheel path of the pavement section.\*\*\*

At the discretion of the Engineer, the continuous friction measuring equipment (CFME) required for friction testing per AC 150/5320-12C (or current version), may be waived due to availability or time constraints and the Department owned/operated ASTM-274 skid trailer used in its place. In this case, the test will be performed using an ASTM-274 skid trailer in accordance with ASTM Standard E-274 using ASTM-501 test tires (ribbed). The results of the skid tests shall be correlated to the values measured by CFME's in order to determine a section's friction characteristics.

If the skid resistance is determined to fall below the minimum skid values noted in TABLE 3-2, in AC 150/5320-12C (or current version), when tested at the speed of 40 mph with approved continuous friction measuring equipment the Contractor will be responsible to immediately remedy the skid problem by a method acceptable to the Engineer; i.e. apply an approved surface treatment, groove the pavement, or overlay the pavement section.

**CONTRACTOR’S CERTIFICATION AND WARRANTY:**

The Contractor shall furnish the manufacturer's certification that each consignment of thermoplastic emulsion shipped to the project meets the requirements of paragraph entitled, Binder Materials, of this specification. The Contractor shall submit a certification that the material proposed has been in field use for a minimum of two (2) years. The Contractor shall furnish a certification demonstrating their experience in the application of a thermoplastic coal tar emulsion slurry seal for a minimum of two years.

**METHOD OF MEASUREMENT:**

The quantity of thermoplastic coal-tar emulsion slurry seal to be paid for will be the number of square yards performed in accordance with the plans and specifications and accepted by the Engineer. The Contractor shall furnish the Engineer with the certified weigh bills when materials are received for the slurry seal used under this contract.

**BASIS OF PAYMENT:**

The accepted quantities of thermoplastic coal-tar emulsion slurry seal will be paid for at the contract unit price per square yard.

The unit prices shown in the contract shall be full compensation for all material, labor, tools, equipment, and all other incidentals necessary to complete the work. The incidental work shall include any profiling of the existing pavement markings, cleaning of the pavement, vegetation removal, etc.

Payment will be made under:

“Thermoplastic Coal-Tar Emulsion Slurry Seal, (0-5000 SY/Airport)..... Square Yards”

“Thermoplastic Coal-Tar Emulsion Slurry Seal, (Greater than 5000 SY/Airport)  
..... Square Yards”

# **THERMOPLASTIC COAL-TAR EMULSION SEALCOAT WITH SAND**

## **DESCRIPTION:**

This item shall consist of an application of thermoplastic coal-tar emulsion sealcoat with sand applied on an existing, previously prepared asphalt surface, in accordance with these specifications for the areas shown on the plans or as designated by the Engineer. The cured seal shall have a homogeneous appearance, adhere firmly to the surface, and have a skid resistant texture. This application is intended to provide a weather barrier with fuel and water resistance.

## **MATERIALS:**

### **Aggregate:**

The aggregate shall be silica sand and shall be composed of clean, hard durable, uncoated particles. The aggregate shall meet the gradation in Table 1, when tested in accordance with ASTM C 136.

**Table 1: Gradation of Aggregates**

<b>Sieve Size</b>	<b>Percentage By Weight Passing Sieves</b>
No. 20	100
No. 35	90-100
No. 50	40-60
No. 65	3-10
No. 100	0-3

### **Binder Materials:**

The emulsion material shall be a thermoplastic coal tar emulsion made up of plastic resin and emulsified coal-tar pitch conforming to the requirements of ASTM D 3320. The thermoplastic coal-tar emulsion shall be manufactured as a complete product, which can be tested at the manufacturing plant. The water content of the emulsion shall not exceed forty-eight percent (48%), +/- 1%, when tested in accordance with ASTM D 244, paragraph 3. A dried film of emulsion shall contain a minimum of eighty-nine percent (89%) of a combination of plastic resin and coal-tar with the remaining percentage being inorganic filler. The dried emulsion shall have a softening point greater than 212°F (100°C) when tested in accordance with ASTM D36. A film of the dried emulsion material, eight (8) mils thick, shall stretch to 5 times its original length at 70°F (21°C) without breaking, and recover thirty-five percent (35%) of this length within one (1) minute.

**Water:**

The Contractor is responsible for obtaining the water used in mixing and it shall be potable and free from soluble salts.

**Composition:**

The thermoplastic emulsion shall be mixed with the aggregate at a minimum rate of 10 pounds of sand per gallon of emulsion to a maximum of 14 pounds of sand per gallon of emulsion and diluted with water for spraying ability.

**EQUIPMENT:**

The mixing equipment shall be a mobile mixing plant and have a capacity to contain at least 400 gallons. It shall have an agitator that will mix the emulsion, aggregate and water to a uniform consistency. The mixer should have a non-shearing pump with a variable rate of flow for spraying the mixture on the pavement. Other tools and equipment, such as power brooms, hand brooms, air compressors, squeegees, etc. shall be provided as needed to properly handle and apply the material.

Descriptive information on the mixing and applying equipment to be used shall be submitted to the Engineer not less than ten (10) days before work starts. All methods employed in performing the work and all equipment, tools, and machinery used for handling materials and executing any part of the work shall be subject to the approval of the Engineer before the work is started.

**WEATHER LIMITATIONS:**

This sealcoat should not be applied when the humidity or impending weather conditions will not allow proper drying and when the atmospheric or pavement temperature is below 50° F, unless otherwise directed by the Engineer.

**CONSTRUCTION METHODS:****General:**

New asphalt and concrete shall be allowed to cure for thirty (30) days prior to the application of the emulsion.

**Surface Preparation:**

The surface shall be cleaned of dust, dirt or other loose foreign matter. Any standard cleaning method will be acceptable except that water flushing will not be permitted in areas where cracks are present in the pavement surface. Any pavement areas that have existing markings on them are not to be treated with the sealcoat unless approved by the Engineer.

Cracks containing vegetation shall be treated with a herbicide and blown free of deleterious materials using heated-compressed air. Further, at the discretion of the Engineer, burning of vegetation with a propane torch will be acceptable.

Areas of the pavement exhibiting the effects of fuel spills shall be treated by scraping off excess oil, heating with a torch, brushing loosened material away, and priming with a solvent type polymeric primer.

#### **Application of Tack/Prime Coat:**

Following preparation of the pavement, a tack/prime coat of thermoplastic coal tar emulsion diluted with fifty percent (50%) water shall be applied to the pavement at the rate of 0.05 gallons per square yard.

#### **Application of Sealcoat:**

The thermoplastic emulsion sealcoat (mixed according to the section in this specification entitled 'Composition') should be sprayed or squeegeed onto the pavement surface, in one coat, at an application rate of .08 to .10 gallons of undiluted emulsion per square yard.

#### **Test Section:**

Prior to full production, the Contractor shall prepare a quantity of mixture sufficient to place a test section of approximately 50 square yards at the application rate specified in this section. The area to be tested will be designed by the Engineer and will be located on the existing pavement. A Tack/Prime coat, the sealcoat, and any additional sealer should be placed in this area to fully represent the work to be performed under this specification.

The test section should be used to verify the adequacy of the mixture and to determine the exact application rate. The same equipment and method of operations shall be used on the test section as will be used on the remainder of the work. If the test section should prove to be unsatisfactory, the necessary adjustments to the mix composition, application rate, placement operations and equipment shall be made. Additional test sections shall be placed and evaluated if required by the Engineer.

#### **Curing:**

The mixture shall be permitted to dry for a minimum of twenty-four (24) hours after the application before opening to traffic or painting, and shall be sufficiently cured to drive over without damage to the sealcoat. Any damage to the uncured mixture will be the responsibility of the Contractor to repair.

#### **Handling:**

The mixture shall be continuously agitated from the time it had been mixed until its application on the pavement surface. The distributor or applicator, pumps and all tools should be maintained in satisfactory working condition.

#### **Skid Resistance:**

**Runway Surfaces:** The runway pavement surfaces treated with the sealcoat may be tested for skid resistance a minimum of forty-eight (48) hours after application. The results of the skid tests must be equal or greater than the Maintenance Planning skid values provided in TABLE 3-2, FRICTION LEVEL CLASSIFICATION FOR RUNWAY PAVEMENT SURFACES, in AC 150/5320-12, *Measurement, Construction, and Maintenance of Skid-resistant*



*Airport Pavement Surfaces*, Table 3-2, (or current version) when tested at the speed of 40 mph with approved continuous friction measuring equipment [CFME].

**Taxiway and Apron Surfaces:** The skid resistance for taxiway and apron surfaces must be inspected by the contractor and engineer a minimum of forty-eight (48) hours after application of the sealcoat. If the Engineer determines the frictional characteristics of a section to be questionable, the section may be tested via the approved means.

\*\*\*Note: Pavement areas tested will be along the common traffic wheel path of the pavement section.\*\*\*

At the discretion of the Engineer, the continuous friction measuring equipment (CFME) required for friction testing per AC 150/5320-12C (or current version), may be waived due to availability or time constraints and the Department owned/operated ASTM-274 skid trailer used in it's place. In this case, the test will be preformed using an ASTM-274 skid trailer in accordance with ASTM Standard E-274 using ASTM-501 test tires. The results of the skid tests shall be correlated to the values measured by CFME's in order to determine a section's friction characteristics.

If the skid resistance is determined to fall below the minimum skid values noted in TABLE 3-2, in AC 150/5320-12C (or current version), when tested at the speed of 40 mph with approved continuous friction measuring equipment the Contractor will be responsible to immediately remedy the skid problem by a method acceptable to the Engineer; i.e. apply an approved surface treatment, groove the pavement, or overlay the pavement section.

### **METHOD OF MEASUREMENT:**

The quantity of thermoplastic coal-tar emulsion sealcoat to be paid for will be the number of square yards performed in accordance with these specifications and plans and accepted by the Engineer. The Contractor shall furnish the Engineer with the certified weigh bills when materials are received for the thermoplastic coal-tar emulsion sealcoat used under this contract.

### **BASIS OF PAYMENT:**

The unit prices shown in the contract shall be full compensation for all material, labor, tools, equipment, and all other incidentals necessary to complete the work. The incidental work shall include cleaning of the pavement, vegetation removal, etc.

Payment will be made under:

“Thermoplastic Coal-Tar Emulsion Sealcoat with Sand, (0-5,000 SY/Airport) ....Square Yards”

“Thermoplastic Coal-Tar Emulsion Sealcoat with Sand, (Greater than 5,000 SY/Airport) ..... Square Yards”

# PAVEMENT SEALER/REJUVENATOR

## DESCRIPTION:

This item governs the application of a pavement sealer/rejuvenator, applied to a previously placed hot-mix asphalt (HMA) surface in accordance with these specifications, as shown on the plans, or as directed by the Engineer. The purpose of this product is to rejuvenate the upper 3/8 inch of oxidized or otherwise aged asphalt binder and provide a fuel resistant surface without causing an appreciable reduction in the friction characteristics (skid resistance) of the pavement. Additionally, the sealer/rejuvenator should not introduce unacceptable pavement distresses such as raveling, high temperature deformation (rutting), and loss of strength. The sealer/rejuvenator should not contribute to accelerated deterioration of the pavement.

## MATERIALS:

### **Rejuvenation Performance:**

The pavement sealer/rejuvenator must be capable of achieving the minimum changes in the asphalt binder properties shown in Tables 1 or 2 after proper application and field exposure.

The binder extracted per ASTM D 2172, Method A and recovered per ASTM D 1856 or D 5404 from samples of the upper 3/8 inch of the surface of the treated pavement must exhibit the percent decrease in absolute viscosity or complex viscosity and corresponding phase angle increase listed in Table 1 or 2, when compared to the values from adjacent untreated samples from the same pavement in the prescribed timeframe.

The bid submittal must include independent laboratory test results accredited by an American Association of State Highway Transportation Officials (AASHTO) Materials Reference Laboratory (AMRL). The test results should verify the ability of the proposed sealer/rejuvenator product to achieve the minimum changes in asphalt binder properties shown in Table 1 or 2.

TABLE 1. Pavement Three (3) Years or Less in Age			
Item #	Property of Recovered Binder <sup>1</sup>	Requirement	Test Method
1	Absolute Viscosity <sub>60°C</sub> , P	≥ 20% Decrease <sup>1</sup>	ASTM D 2171
2a	Complex Modulus <sub>60°C</sub> , G*		AASHTO T 315
2b	Viscosity <sub>60°C</sub> , $\eta = G^* / \omega$ , Pa·s		
2c	Phase Angle <sub>60°C</sub> , $\delta$ , °	Report	
TABLE 2. Pavement More Than Three (3) Years in Age			
1	Absolute Viscosity <sub>60°C</sub> , P	≥ 30% Decrease <sup>1</sup>	ASTM D 2171
2a	Complex Modulus <sub>60°C</sub> , G*, kPa		AASHTO T 315
2b	Viscosity <sub>60°C</sub> , $\eta^* = G^* / \omega$ , Pa·s		
2c	Phase Angle <sub>60°C</sub> , $\delta$ , °	Report	

<sup>1</sup> Procedures: Sample collection for application and acceptance as noted in this specification. Sample weights and measure by ASTM D 3549; Extraction by: ASTM D 2172, Method A (conditioning to remove moisture will not be accomplished); Recovery by: ASTM D 1854 (Abson) or ASTM D 5404 (Roto-Vap); and binder extraction, recovery and testing within 48 hours of obtaining pavement cores or equivalent surface area samples.

### **Fuel Resistance Performance:**

The pavement sealer/rejuvenator must be capable of providing a fuel resistant barrier on the previously prepared HMA surface in order to protect the HMA from raveling, disintegration, and other deleterious effects of allowing fuel and/or oil to come in direct contact with the asphalt binder. The fuel resistance of the treated asphalt concrete pavement may be determined in accordance with ASTM D 1308, at least twenty-four (24) hours after application of the coal tar sealer/rejuvenator. Softening of the treated pavement surface, with no recovery, will be considered a fuel resistance failure. Acceptance of the field fuel resistance of the treated asphalt concrete pavement(s) will be determined by the Engineer.

### **Material Documentation/Certification:**

**Performance History:** The bid submittal must include documentation of previous use and test data conclusively demonstrating that the sealer/rejuvenator product has been used successfully for a period of three or more years by other user agencies; and that the asphalt sealer/rejuvenator product has been proven to perform in a manner equivalent to this specification, through field testing by/for using agencies as to the required change in the recovered asphalt binder properties and fuel resistance. The performance documentation must be presented from a geographically similar climatic region of the United States as that for North Carolina.

**Friction:** The bidder must provide evidence of past performance that the sealer/rejuvenator, a minimum of 48 hours after application, has not caused a decrease in pavement frictional characteristics [skid resistance] below the maintenance planning requirements specified in AC 150/5320-12C, *Measurement, Construction, and Maintenance of Skid-resistant Airport Pavement Surfaces*, Table 3-2 (or current version), when tested at the speed of 40 mph with approved continuous friction measuring equipment [CFME].

**Health, Safety, and Environment:** The bidder shall provide a complete material safety data sheet (MSDS). The MSDS, Section II, shall include the chemical abstracts service (CAS) registry numbers for all applicable hazardous ingredients in the sealer/rejuvenator product. The manufacturer should certify that the sealer/rejuvenator is in compliance with the Code of Federal Regulation Title 40 – Protection of Environment. The manufacturer's certification shall address compliance for Air Programs, Part 59, National Volatile Organic Compound Emission Standards for Consumer and Commercial Products [for the airport location] and Water Programs, Part 116, Designation of Hazardous Substances.

**\*\*\*NOTE: Any sealer/rejuvenator product that has undergone a formulation change or product improvement may, at the discretion of the Engineer, be accepted for use provided the past performance history of the product, prior to any formulation changes or improvements, meets the performance history requirements of this specification.\*\*\***

### **EQUIPMENT:**

The Contractor shall furnish all equipment and hardware necessary for the performance of the work. The sealer/rejuvenator shall be delivered in dedicated tankers and/or containers with agitating equipment and filters, per manufacturer's recommendations.

Surface preparation equipment must include a power broom and/or blower for removing deleterious material from the pavement surface.

The distributor must be designed and equipped in accordance with the manufacturer's recommendations, but include as a minimum, the following characteristics:

- a) Adequate heating capability for rapid heating of the sealer/rejuvenator to the proper application temperature.
- b) A positive displacement pump capable of pumping low viscosity material and providing a pre-selected constant pressure of 20-60 psi to deliver the specified rates of application.
- c) A full circulation spray bar and applicator which maintains proper nozzles which provide the specified rate of application.
- d) A hooded spray bar and applicator which maintains proper nozzle height.
- e) A positive shut-off for the spray bar.
- f) A hand spray (with hose) equipped with a positive shut-off at the spray gun.
- g) A thermometer installed in the distributor tank to measure the temperature of the sealer/rejuvenator at the time of the application.
- h) A tachometer calibrated to a minimum of tenths of miles per hour.
- i) A chart listing the capacity of the tank (in gallons) for each 1-inch of depth. A chart showing speed/pressure application rates will also be included.
- j) The distributor shall be equipped with filters that shall be fully functional during both loading and unloading of the product.

### **WEATHER LIMITATIONS:**

The sealer/rejuvenator must be applied only when the existing surface is dry and the air temperature is in accordance with the manufacturer's recommendations for application and curing or 50°F (10°C) or higher, and rising, whichever is greater. The sealer/rejuvenator must not be applied during inclement weather or when rain or freezing temperatures are anticipated within 24 hours before or after application. If weather conditions interfere with application and/or curing, the Engineer may at his discretion suspend the job or require remedial action as deemed necessary.

### **CONSTRUCTION METHODS:**

#### **Worker Safety:**

The contractor must have available at all times a Material Safety Data Sheet (MSDS) for the sealer/rejuvenator and require workmen to follow the manufacturer's recommended safety precautions.

#### **Surface Preparation:**

Prior to placing the sealer/rejuvenator, the Contractor shall utilize a power broom (or approved equal) to clean the surfaces of the pavement to be treated and assure that it is free of all debris, vegetation, rubber deposits, oil/fuel spills, dust, dirt, or other loose matter. The pavement surface shall be properly cleaned by the Contractor to the satisfaction of the Engineer prior to sealer/rejuvenator application.

#### **Determination of Application Rates:**

Prior to full production, the contractor must place a series of test sections (minimum one square yard) at application rates as judged necessary by the manufacturer in order to achieve the specified performance. At a minimum, a test section is required for each different HMA mix design identified in the project and the location of the test sections shall be selected by the Engineer. Additional test sections may be required due to highly variable traffic areas, e.g., taxiway pavement wheel paths versus taxiway edge areas or specific areas identified by the Engineer.

Following the application, the surface shall be allowed to cure without being disturbed for at least 24 hrs or until the sealer has thoroughly dried. No traffic shall be permitted on the treated surface until curing is complete.

The Contractor, Engineer, and/or the Manufacturer's representative shall examine the test sections 24 hours after placement. The Contractor and/or the Manufacturer's representative will recommend an application rate for each different pavement section to the Engineer for final approval. Application rates that have not allowed full penetration

into the pavement surface after twenty-four (24) hours, shall not be permitted for full production.

Prior to full application on any runway, the Contractor must then apply the material to a test section large enough for friction testing at the application rate approved by the Engineer. This area may be tested by the Engineer to ensure conformance with the specification. Application rates that result in an average Mu value on the wet runway pavement surface less than the Maintenance Planning Friction Level in Table 3-2 of Federal Aviation Advisory Circular 150/5320-12, "Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces" will not be approved for full application.

#### **Application of Sealer/Rejuvenator:**

Following preparation and subsequent inspection and acceptance of the surface by the Engineer, the sealer/rejuvenator product shall be uniformly applied over the surface to be treated at the approved rate with an allowable variation from the approved rate of application of plus or minus 5 percent, in accordance with ASTM D 2995.

Sealer/rejuvenator shall be applied at the temperature recommended by the manufacturer.

#### **Additional Sealer/Rejuvenator Application Procedures:**

**Pavement Markings:** The Contractor shall ensure that sealer/rejuvenator is NOT placed on any existing paint markings with the exception of those markings described herein. Paint markings shall be preserved in such a manner that existing markings can be readily and accurately relocated to their exact location, dimension, and color. Paint markings that sealer/rejuvenator can be applied over are all six (6) inch yellow taxiway and apron markings.

**Calibration Test:** Contractor must furnish all equipment, materials, and labor necessary to calibrate the bituminous distributor or other application equipment. Calibration must be made with approved job material and prior to applying the sealer/rejuvenator to the prepared surface. Calibration of the bituminous distributor and the specialized bituminous spray applicator must be in accordance with ASTM D 2995.

**Ponding and Puddling of Sealer/rejuvenator:** If low spots and depressions in the pavement surface cause ponding or puddling of the sealer/rejuvenator, the pavement surface must be broomed with a broom drag. Brooming should continue until the pavement surface is free of any pools of excess material. Ponding and/or puddling must not cause excess pavement softening and/or additional distress. The engineer must inspect and approve areas after brooming.

**Excess Runoff of Sealer/rejuvenator:** The application rate should be reduced, and the engineer notified, if the surface grade of the pavement surface causes excessive

runoff of the sealer/rejuvenator. Additional sealer/rejuvenator, if necessary, may be subsequently applied after the first application of material has penetrated into the pavement to achieve the required properties of the treated binder.

**Insufficient Sealer/rejuvenator:** When it is determined by the engineer that the actual application rate of the sealer/rejuvenator is more than 5 percent below the approved application rate, subsequent applications of materials must be made to bring the actual application rate up to the approved rate; additional sealer/rejuvenator must penetrate into the pavement surface within 24 hours after application. Multiple applications if required may at the discretion of the engineer, require additional pavement sampling and rejuvenation testing to assure compliance with Table 1 or 2 in the Materials section of this specification.

### **Cure Time and Friction Remedial Option - Application of Sand:**

The Contractor shall apply sand to the surface of the treated asphalt concrete pavement(s) if the sealer/rejuvenator does not cure within 24 hours or if the frictional characteristics (skid resistance) have been reduced to a level below the maintenance planning requirements specified in AC 150/5320-12C, *Measurement, Construction, and Maintenance of Skid-resistant Airport Pavement Surfaces*, Table 3-2, (or current version) when tested at the speed of 40 mph with approved continuous friction measuring equipment [CFME].

The sand shall be dry, hard, durable, free from clay, salt and foreign matter, and well graded (one hundred percent (100%) minus 2.36-mm and less than ten percent (10%) minus 0.0150-mm). The sand shall be uniformly applied at a rate of 3.0 lb/yd<sup>2</sup>, rolled (as recommended by the Contractor and accepted by the Engineer) into the treated surface and with any surplus removed with a power broom, or as directed by the Engineer. The Contractor shall be responsible for all materials, equipment, and costs associated with the application of sand.

In the case of non-acceptable frictional characteristics (skid resistance) the Contractor may attempt to improve the frictional characteristics with the use of a steel power broom in lieu of sand application. The acceptability of such steel power brooming shall be determined by the Engineer. The cost of any steel power brooming shall be the responsibility of the Contractor.

All sand used during the treatment must be removed as soon as practical after treatment of a pavement and prior to opening any airfield runway, taxiway, etc. This shall be accomplished by a combination of hand and mechanical sweeping. All turnouts, etc. must be cleaned of any sand to the satisfaction of the Engineer. Pavement sweeping will be included in the price bid per square yard for sealer/rejuvenator.

If, after sand is swept and in the opinion of the Engineer a hazardous condition exists on the pavement, the Contractor must apply additional sand and sweep same immediately

following reapplication. No additional compensation will be allowed for reapplication and removal of sand.

## **QUALITY ASSURANCE AND ACCEPTANCE:**

### **Rejuvenation Acceptance:**

#### **Field Sampling:**

- a) Sampling of the pavement sections to be treated shall be performed before and after the pavement has been sealed. The Contractor shall be responsible for obtaining all pavement cores for testing. A minimum of two (2) pavement cores, 6-inches in diameter, will be taken from each different type and category of pavement surface to be treated. The actual number of cores to be taken depends on the viscosity testing method employed, ASTM D 2171 or ASSHTO T 315. Cores will be taken before sealer/rejuvenator is placed and then again after application. The Engineer will determine number of pavement cores to be taken and the exact pavement core locations. The Contractor shall repair any holes resulting from the removal of asphalt concrete pavement cores (with suitable materials and methods as approved by the Engineer) at no additional cost to the Department.
- b) The pavement core samples must be taken 30-45 days after application of the sealer/rejuvenator.
- c) A minimum of one series of pavement core samples must be performed for each 25,000 square yards or fractional part of treated pavement section per pavement plan or as required by the Engineer. Sample locations will be determined by the Engineer on a random basis.
- d) Pavement core samples must be placed in labeled sealable plastic bags immediately after taking, cleaning, and removing sampling water by blotting. The sealed samples must then be placed in labeled plastic core canisters and immediately given to the Engineer.

#### **Rejuvenation Testing Responsibility:**

All acceptance testing necessary to determine conformance with this specification shall be performed by the Engineer, or accredited independent test agency, to verify that the sealer/rejuvenator achieves the minimum decrease in the asphalt binder properties as measured from binder in the top  $3/8 \pm 1/32$  inch of the samples.

**Rejuvenation Testing:** Tests will be conducted to extract the bituminous binder from the top  $3/8 \pm 1/32$  inch of the cores/slabs precisely cut from the field specimens.



- a) Binder extraction must be by ASTM D 2172, Method A (centrifuge) with toluene, and recovered according to ASTM D 1856 (Abson Method) or ASTM D 5404 (Roto-Vap Method).

Viscosity of the bituminous material must be measured in accordance with ASTM D 2171. The percent decrease in the binder properties must be computed as follows:

$$100 \left( \frac{[(\text{absolute viscosity, } P, \text{ of untreated sample}) - (\text{absolute viscosity, } P, \text{ of treated sample})]}{(\text{absolute viscosity, } P, \text{ of untreated sample})} \right)$$

The complex modulus,  $G^*$ , kPa, must be measured in accordance with AASHTO T 315 C, at 60°C (140°F) 10 rad/sec or other recorded frequency. The percent decrease in the binder properties must be computed as follows:

$$100 \left( \frac{[(\text{complex modulus, } G^*, \text{ kPa of untreated sample}) - (\text{complex modulus, } G^*, \text{ kPa, of treated sample})]}{(\text{complex modulus, } G^*, \text{ kPa, of untreated samples})} \right)$$

The complex viscosity,  $\eta^*$ , at 60°C (140°F) must be calculated and reported from the complex modulus,  $G^*$  and angular frequency,  $\omega$  (radians/sec).

- b) Test results for absolute viscosity, complex modulus (and viscosity), and phase angle must be reported. The maximum percent reduction calculated for absolute viscosity or complex modulus must be considered in BASIS OF PAYMENT.
- c) In the event of binders recovered from aged pavements and/or pavements using polymer modified binders (before treatment) exhibiting absolute viscosities  $\geq 200,000$  P (data becomes suspect, viscosity exceeds test capabilities) the viscosity reduction compliance requirement should be determined based on the complex modulus,  $G^*$ , kPa.

#### **Skid Resistance Acceptance:**

- a) **Runway Surfaces:** The runway pavement surfaces treated with sealer/rejuvenator product must be tested for skid resistance a minimum of forty-eight (48) hours after application. The results of the skid tests must be equal or greater than the Maintenance Planning skid values provided in TABLE 3-2, FRICTION LEVEL CLASSIFICATION FOR RUNWAY PAVEMENT SURFACES, in AC 150/5320-12C, *Measurement, Construction, and Maintenance of Skid-resistant Airport Pavement Surfaces*, Table 3-2, (or current version) when tested at the speed of 40 mph with approved continuous friction measuring equipment [CFME].
- b) **Taxiway and Apron Surfaces:** The skid resistance for taxiway and apron surfaces must be inspected by the contractor and engineer a minimum of forty-eight (48) hours after application of the sealer/rejuvenator. If the Engineer determines the frictional

characteristics of a section to be questionable, the section must then be tested via the approved means.

\*\*\*Note: Pavement areas tested will be along the common traffic wheel path of the pavement section.\*\*\*

At the discretion of the Engineer, the continuous friction measuring equipment (CFME) required for friction testing per AC 150/5320-12C (or current version), may be waived due to availability or time constraints and the Department owned/operated ASTM-274 skid trailer used in its place. In this case, the test will be performed using an ASTM-274 skid trailer in accordance with ASTM Standard E-274 using ASTM-501 test tires. The results of the skid tests shall be correlated to the values measured by CFME's in order to determine a section's friction characteristics.

In the event the skid resistance of either of these surfaces is determined to be unacceptable by friction testing and the Engineer, the contractor must exercise the Cure Time and Friction Remedial Option – Application of Sand. If the skid resistance is determined to fall below the **minimum** skid values noted in TABLE 3-2, in AC 150/5320-12C (or current version), when tested at the speed of 40 mph with approved continuous friction measuring equipment the Contractor will be responsible to immediately remedy the skid problem by a method acceptable to the Engineer; i.e. apply an approved surface treatment, groove the pavement, or overlay the pavement section.

#### **Fuel Resistance Acceptance:**

The fuel resistance of the treated asphalt concrete pavement may be determined in accordance with ASTM D 1308, at least twenty-four (24) hours after application of the coal tar sealer/rejuvenator. Softening of the treated pavement surface, with no recovery, will be considered a fuel resistance failure. Acceptance of the fuel resistance of the treated asphalt concrete pavement(s) will be determined by the Engineer.

#### **Grooved Surfaces Acceptance:**

On grooved runways, the material shall not soften the surface to the extent that closing of the grooves will occur when the pavement is subjected to aircraft tire loads. The Engineer shall make a determination as to whether closing of the grooves is likely after the material has cured for at least forty-eight (48) hours. Material or application rates that, in the judgment of the Engineer, are likely to result in closure of the grooves shall not be used. In no case shall groove deterioration exceed that recommended by AC 150/5320-12C or current version.

#### **Manufacturer Representation:**

The Contractor shall have a manufacturer's representative on the job site at the beginning of the work at the first airport in which the sealer/rejuvenator is applied and the manufacturer's representative shall be made available for future field visits as required by

the Engineer. The manufacturer's representative shall have knowledge of the material, procedures, and equipment described in the specification and shall oversee the mixing and application of the sealer/rejuvenator. The manufacturer shall be the same as the manufacturer supplying the sealer/rejuvenator to be used on the project. Documentation of the manufacturer representative's experience and knowledge for applying sealer/rejuvenator shall be furnished to the Engineer prior to start of production. The cost of the manufacturer's representative shall be included in the bid price.

### **WARRANTY:**

The Contractor must provide a manufacturer's/applicator warranty that the treated pavement will retain the lower binder properties of Table 1 or 2, for a period of two (2) years from the date of treatment. For compliance with the warranty, the Department may obtain cores and perform tests in accordance with the section "Rejuvenation Acceptance". The contractor must further warrant that from the date the sealer/rejuvenator was applied, the material will not flake, peel, chip, spall, nor otherwise contribute to or accelerate the aging of the pavement.

The Contractor will warrant the treated surface to be fuel resistant and remain fuel resistant for a period of two (2) years after the date of application. This guarantee shall be effective only if spills are cleaned up as required by local Environmental Protection Agency (EPA) regulations.

The contractor must reapply the sealer/rejuvenator, as necessary, or provide remedial actions at no cost to the owner, and/or refund all payments at the Engineer's discretion.

### **METHOD OF MEASUREMENT:**

The quantity of sealer/rejuvenator to be paid for will be the number of square yards performed in accordance with the plans and specifications and accepted by the Engineer. The Contractor shall furnish the Engineer with the certified weigh bills when materials are received for the sealer/rejuvenator used under this contract.

**BASIS OF PAYMENT:**

Payment for accepted sealer/rejuvenator will be made at the contract unit price per square yard for “Sealer/Rejuvenator” adjusted. The price shall fully compensate the Contractor for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

**Table 3. Rejuvenation Pay Reduction.**

<b>Binder Rejuvenation at Acceptance; % Reduction in Absolute Viscosity or Complex Modulus</b>		<b>% Payment</b>
<b>Pavement <b>More Than</b> Three Years in Age</b>	<b>Pavement <b>Less Than</b> Three Years in Age</b>	
<b>≥ 30</b>	<b>≥ 20</b>	<b>100</b>
<b>20.0 - 29.9</b>	<b>10.0 - 19.9</b>	<b>80</b>
<b>Less than 20.0</b>	<b>Less than 10.0</b>	<b>No payment</b>

Payment will be made under:

“Pavement Sealer/Rejuvenator, (0-5,000 SY/Airport) ..... square yards

“Pavement Sealer/Rejuvenator, (Greater than 5,000 SY/Airport).... square yards

# **AIRFIELD REPAINTING AND REMARKING**

## **DESCRIPTION:**

The work covered by this specification consists of remarking airfield pavement surfaces with pavement markings and shall consist of placing fresh markings directly onto existing airfield pavement markings. The painting work is considered remarking whenever markings are being installed back at generally the same location and the same width as the previous markings. If increasing the width or length of the new markings require the old markings to be removed, therefore causing new markings to be laid out, those markings will be paid for under pay item, New Airfield Painting and Marking. The markings shall be of the color, length, thickness, and width as specified, or as directed by the Engineer. The Contractor shall furnish all materials, services, labor, and equipment necessary for the required pavement preparation and pavement marking installation. Sufficient personnel experienced in the handling and application to the materials shall be provided by the Contractor to assure the work is done properly.

## **MATERIALS:**

### **Paint:**

The paint for painting numbers, markings, and stripes shall meet the requirements of Federal Specifications TT-P-1952D Type I or II (Waterborne). Paint shall be furnished in white (37925), yellow (33655), and black (37038).

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine.

### **Glass Spheres:**

Glass Spheres are required for all markings unless otherwise directed by the Engineer and shall meet the requirements of Federal Specification TT-B-1325 C, Type I, Gradation A.

### **Materials Verification:**

The Contractor shall furnish certified test reports for the materials shipped to the project. The reports shall not be interpreted as a basis for final acceptance. The Contractor shall notify the Engineer upon arrival of a shipment of paint to the job site. All emptied containers shall be made available for inspection by the Engineer. The containers shall not be removed from the airport or destroyed until authorized by the Engineer. The Contractor will be required to provide a quantity list of all paint and glass spheres used for this contract to the Engineer once all work has been completed and approved.

## **EQUIPMENT:**

All equipment for the work shall be approved by the Engineer and shall include the apparatus necessary to properly clean the existing surface, a truck mounted mechanical marking machine, and such auxiliary hand painting equipment as maybe necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type-marking machine for application of traffic paint. It shall produce an even and uniform film thickness at the required coverage and shall be designed so as to apply markings of uniform cross section and clear-cut edges without running or spattering and without over spray.

### **WEATHER LIMITATIONS:**

Marking shall be performed only when the pavement surface is dry and above 50°F, when the atmospheric temperature is above 50°F (10°C), and when weather is not foggy or windy.

### **CONSTRUCTION METHODS:**

#### **General:**

All marking paint shall be installed in accordance with the manufacturer's installation instructions, unless otherwise specified herein. All surface preparations including surface cleaning and surface pretreatment, shall be done by the Contractor in accordance with the manufacturer's recommendations, subject to the approval of the Engineer. Do not use handliners or any other non-truck mounted pavement-marking machine to install pavement markings for line applications longer than 1,000 feet.

#### **Preparation of Surface:**

Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other foreign material, which would reduce the bond between the paint and the pavement. The area to be painted shall be cleaned by sweeping and blowing or by other methods as required to remove all dirt, vegetation, laitance, and loose material. Remove all loose, flaking paint from existing painted areas that are to be remarked with compatible materials. Hard, firm paint that has the surface chalk removed may remain in such areas.

If sweeping and blowing prove to be insufficient at cleaning the surface or if surface is exceptionally contaminated, the Engineer may, at his discretion, invoke the line item for Pavement Marking Cleaning in order to sufficiently prepare the surface for paint application.

#### **Layout of Markings:**

On those sections of pavement where previously applied markings are available to serve as a guide or where markings are to be revised, the proposed markings shall be laid out in advance of the paint application. All markings shall be in accordance with the plans as provided in this contract and the FAA AC 150/5340-1J, Standards for Airport Markings. If a change in runway numerals is required it will be considered a pay item under New Airfield Painting and Marking.

## **Application:**

### **General:**

Markings shall be applied at the locations and to the dimensions and spacing as shown on the Plans. Paint shall not be applied until the layout and condition of the surface has been approved by the Engineer.

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine as noted below. The addition of thinners will not be permitted.

### **Application rate for markings onto previously marked surfaces:**

- Over previously applied markings the paint will be applied at a rate of 100-115 square feet per gallon in one application.

### **Glass Spheres:**

Glass spheres shall be distributed to the surface of the marked areas immediately after application of the paint. A dispenser shall be furnished which is properly designed for attachment to the marking machine and suitable for dispensing glass spheres. The spheres shall be applied at the rate of **7 pounds per gallon of paint**. The glass spheres shall be spread uniformly over the entire surface of the paint. Any deviations from these specifications must be approved by the Engineer.

## **Lateral Deviation Requirements:**

Lines shall be of the length and longitudinal placement as shown in the plans or described in this contract. The Contractor shall provide sufficient control points to serve as guides for application of markings. The markings shall be straight or of uniform curvature and shall conform uniformly with tangents, curves, and transitions. The finished lines shall be free from waviness. In judging waviness, the edges of the markings shall not vary from a straight line more than ½-inch in 50-feet, and the dimensions and spacing shall be within a tolerance of plus or minus five percent (5%). Any greater deviation may be sufficient cause for requiring the Contractor to remove and correct such markings at no cost to the Department.

## **Maintenance:**

Pavement markings installed by the Contractor which deteriorate, or fail to adhere to the pavement, or lack retroreflectivity, shall be replaced by the Contractor at no cost to the Department or the Airport. Pavement markings to be replaced shall be as determined by the Engineer.

## **Signing and Traffic Control:**

The Contractor shall furnish and place all warning and directional signs and other traffic control devices required to direct, control, and protect the traveling public while marking operations are in process.

No direct payment for signing and traffic control items will be made, as it shall be considered incidental to the application of the pavement markings, and the cost of same shall be included in the unit price bid for Airfield Repainting and Remarkings.

**Protection:**

The Contractor shall protect the marking until dry by placing guarding or warning devices as necessary. In the event any traffic crosses the wet markings, such markings shall be re-applied and the Contractor shall remove tracks made by the traffic.

**Corrective:**

All work shall be subject to application rate checks for both paint and glass spheres. All work that fails to meet the specifications, permissible tolerances and appearance requirements, or is marred or damaged by traffic or from other causes, shall be corrected at the Contractor's expense. All misted areas, drip and spattered paint shall be removed to the satisfaction of the Engineer. In all instances, when it is necessary to remove paint, it shall be done by means satisfactory to the Engineer, which will not damage the underlying surface of the pavement.

**PAVEMENT MARKING OBSERVATION PERIOD:**

Following completion of all work required to be completed, there will be a sixty (60) day observation period for the pavement markings before final acceptance.

Pavement markings that fail to meet all requirements of this contract during the observation period shall be removed and replaced at no expense to the Department or the Airport. The Contractor shall replace all pavement markings failing the requirements of this specification within sixty (60) days following notification by the Engineer of such failing. All replacement pavement markings shall meet all requirements of this contract for a minimum of sixty (60) calendar days after installation.

Marking replacement shall be performed in accordance with the requirements specified herein for the initial application, including but not limited to surface cleaning, etc.

During the sixty (60) day observation periods, the pavement markings installed under this contract shall be warranted by the Contractor against failures such as discoloration, chipping, spalling, poor adhesion, and loss of reflectivity, caused by the effects of improper cleaning, application methods, or application equipment.

**METHOD OF MEASUREMENT:**

The quantity of runway, taxiway, and apron markings to be paid for shall be the number of square feet of paint applied in accordance with the specifications and accepted by the Engineer.



**BASIS OF PAYMENT:**

Payment for Airfield Repainting and Remarking, shall be made at the contract unit bid price per square foot. This price shall be full compensation for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the items. Such prices and payment will be full compensation for all work covered by these provisions including but not limited to removing and replacing pavement markings that fail during the sixty (60) day Observation Period.

Payment will be made under:

“Runway Repainting and Remarking, (0-6,000 SF/Airport)..... square feet”

“Runway Repainting and Remarking, (Greater than 6,000 SF/Airport).....square feet”

“Taxiway and Apron Repainting and Remarking, (0-1,000 SF/Airport) ..... square feet”

“Taxiway and Apron Repainting and Remarking, (Greater than 1,000 SF/Airport) .....square feet”

# **NEW AIRFIELD PAINTING AND MARKING**

## **DESCRIPTION:**

The work covered by this specification consists of marking airfield pavement surfaces with new pavement markings at locations as described in this contract. Marking shall be done with paint provided by the Contractor as specified herein. The markings shall be of the color, length, thickness, and width as specified, or as directed by the Engineer. The Contractor shall furnish all material, services, labor, and equipment necessary for the required pavement preparation and pavement marking installation. Sufficient personnel experienced in the handling and application of the materials shall be provided by the Contractor to assure the work is done properly.

## **MATERIALS:**

### **Paint:**

The paint for painting numbers, markings, and stripes shall meet the requirements of Federal Specifications TT-P-1952D Type I or II (Waterborne). Paint shall be furnished in white (37925), yellow (33655), red (31136), and black (37038).

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine.

### **Glass Spheres:**

Glass Spheres are required for all markings unless otherwise directed by the Engineer and shall meet the requirements of Federal Specification TT-B-1325 C, Type I, Gradation A.

### **Materials Verification:**

The Contractor shall furnish certified test reports for the materials shipped to the project. The reports shall not be interpreted as a basis for final acceptance. The Contractor shall notify the Engineer upon arrival of a shipment of paint to the job site. All emptied containers shall be made available for inspection by the Engineer. The containers shall not be removed from the airport or destroyed until authorized by the Engineer. The Contractor will be required to provide a quantity list of all paint and glass spheres used for this contract to the Engineer once all work has been completed and approved.

## **EQUIPMENT:**

All equipment for the work shall be approved by the Engineer and shall include the apparatus necessary to properly clean the existing surface, a truck mounted mechanical marking machine, and such auxiliary hand painting equipment as maybe necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type-marking machine for application of traffic paint. It shall produce an even and uniform film thickness at the required coverage and shall be designed so as to apply markings of uniform cross section and clear-cut edges without running or spattering and without over spray.

### **WEATHER LIMITATIONS:**

Marking shall be performed only when the pavement surface is dry and above 50°F, when the atmospheric temperature is above 50°F, and when weather is not foggy or windy.

### **CONSTRUCTION METHODS:**

#### **General:**

All marking paint shall be installed in accordance with the manufacturer's installation instructions, unless otherwise specified herein. All surface preparations including surface cleaning and surface pretreatment shall be done by the Contractor in accordance with the manufacturer's recommendations, subject to the approval of the Engineer. The Contractor shall not use handliners or any other non-truck mounted pavement-marking machine to install pavement markings for line applications longer than 1,000 feet.

#### **Preparation of Surface:**

Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance or other foreign material, which would reduce the bond between the paint and the pavement. The area to be painted shall be cleaned by sweeping and blowing or by other methods as required to remove all dirt, vegetation, laitance and loose material.

Paint shall not be applied to new Portland Cement Concrete (PCC) pavement until the areas to be painted are clean of curing material. Sandblasting or high-pressure water shall be used to remove curing materials.

If sweeping and blowing prove to be insufficient at cleaning the surface or if surface is exceptionally contaminated, the Engineer may invoke the line item for Pavement Marking Cleaning in order to sufficiently prepare the surface for paint application.

#### **Layout of Markings:**

Markings shall be laid out in advance of the paint application. All markings shall be in accordance with the plans as provided by the Engineer and FAA AC 150/5340-1J, Standards for Airport Markings or its most current version.

## **Application:**

### **General:**

Markings shall be applied at the locations and to the dimensions and spacing as shown on the Plans. Paint shall not be applied until the layout of the markings and condition of the surface has been approved by the Engineer.

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine as noted below. The addition of thinners will not be permitted.

New airfield pavement markings may be applied on either newly constructed pavement surfaces or on existing(aged) pavement surfaces. These different surfaces each have unique conditions and therefore have unique specifications for the application of pavement markings. The specifications for the different surface conditions are noted in the following paragraphs.

### **New Pavement Marking on an Existing(Aged) Surfaces:**

Application rate for markings on existing (aged) surfaces:

- Pavement markings will be applied at a rate of 100-115 square feet per gallon in one application.
- This applies to all Runway, Taxiway, and Apron markings.

### **New Pavement Marking Following Construction of a New Surface Course:**

The application of the pavement markings will be performed in two stages when applied following a new surface course. Stage one will include the placement of the runway prime coat as specified and as shown on the plans within seventy-two (72) hours after the placement of the final pavement surface. Stage two includes the final application of all markings as specified and as shown on the plans. A period of thirty (30) days shall elapse between placement of the final surface course or seal coat and the stage two application of paint.

### **Application rates for Runway markings on new pavement surfaces:**

- Prime coat will be applied at a rate of 230 square feet per gallon.
- Final coat will be applied at a rate of 100-115 square feet per gallon.
- NO beads shall be applied with prime coat.

### **Application rate for Taxiway and Apron markings on new pavement surfaces:**

- Pavement markings will be applied at a rate of 100-115 square feet per gallon.
- No prime coat application required.

**Glass Spheres:**

Glass spheres shall be distributed to the surface of the marked areas immediately after application of the paint. A dispenser shall be furnished which is properly designed for attachment to the marking machine and suitable for dispensing glass spheres. The spheres shall be applied at the rate of **7 pounds per gallon of paint**. The glass spheres shall be spread uniformly over the entire surface of the paint. Any deviations from these specifications must be approved by the Engineer.

**Lateral Deviation Requirements:**

Lines shall be of the length and longitudinal placement as shown in the plans or described in this contract. The Contractor shall provide sufficient control points to serve as guides for application of markings. The markings shall be straight or of uniform curvature and shall conform uniformly with tangents, curves, and transitions. The finished lines shall be free from waviness. In judging waviness, the edges of the markings shall not vary from a straight line more than ½-inch in 50-feet, and the dimensions and spacing shall be within a tolerance of plus or minus five percent (5%). Any greater deviation may be sufficient cause for requiring the Contractor to remove and correct such markings at no cost to the Department.

**Maintenance:**

Pavement markings installed by the Contractor which deteriorate, or fail to adhere to the pavement, or lacks retroreflectivity, shall be replaced by the Contractor at no cost to the Department or the Airport. Pavement markings to be replaced shall be as determined by the Engineer.

**Signing and Traffic Control:**

The Contractor shall furnish and place all warning and directional signs and other traffic control devices required to direct, control, and protect the traveling public while marking operations are in process.

No direct payment for signing and traffic control items will be made, as it shall be considered incidental to the application of the pavement markings, and the cost of same shall be included in the unit price bid for New Airfield Painting and Marking.

**Protection:**

The Contractor shall protect the marking until dry by placing guarding or warning devices as necessary. In the event any traffic crosses the wet markings, such markings shall be re-applied and the Contractor shall remove tracks made by the traffic.

**Corrective:**

All work shall be subject to application rate checks for both paint and glass spheres. All work that fails to meet the specifications, permissible tolerances and appearance requirements, or is marred or damaged by traffic or from other causes, shall be corrected at the Contractor's expense. All misted areas, drip and spattered paint shall be removed to the satisfaction of the Engineer. In all instances, when it is necessary to remove paint, it shall be done by means satisfactory to the Engineer, which will not damage the underlying surface of the pavement.

**PAVEMENT MARKING OBSERVATION PERIOD:**

Following completion of all work required to be completed, there will be a sixty (60) day observation period for the pavement markings before final acceptance.

Pavement markings that fail to meet all requirements of this contract during the observation period shall be removed and replaced at no expense to the Department or the Airport. The Contractor shall replace all pavement markings failing the requirements of this specification within sixty (60) days following notification by the Engineer of such failing. All replacement pavement markings shall meet all requirements of this contract for a minimum of sixty (60) calendar days after installation.

Marking replacement shall be performed in accordance with the requirements specified herein for the initial application, including but not limited to surface cleaning, etc.

During the sixty (60) day observation periods, the pavement markings installed under this contract shall be warranted by the Contractor against failures such as discoloration, chipping, spalling, poor adhesion, and loss of reflectivity, caused by the effects of improper cleaning, application methods, or application equipment.

**METHOD OF MEASUREMENT:**

The quantity of runway, taxiway, and apron markings to be paid for shall be the number of square feet of paint performed in accordance with the specifications and accepted by the Engineer.

**BASIS OF PAYMENT:**

Payment for New Airfield Painting and Marking shall be made at the contract unit bid price per square foot for each Paint Type. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools and incidentals necessary to complete the item. Such prices and payment will be full compensation for all work covered by these provisions including but not limited to removing and replacing pavement markings that fail during the 60-day Observation Period.

Payment will be made under:

“New Runway Painting and Marking, (0-6,000 SF/Airport)..... square feet”

“New Runway Painting and Marking, (Greater than 6,000 SF/Airport)..... square feet”

“New Taxiway and Apron Painting and Marking, (0-1,000 SF/Airport) ..... square feet”

“New Taxiway and Apron Painting and Marking, (Greater than 1,000 SF/Airport) ..... square feet”

# **PAVEMENT MARKING REMOVAL**

## **DESCRIPTION:**

This item shall consist of removing existing pavement markings from paved areas designated on the drawings or required by the Engineer. The Contractor shall schedule and coordinate the removal operations with the Engineer prior to the start of any work and removal operations shall not commence until adequate provisions have been made to complete the installation of replacement markings. The degree of pavement marking removal will be determined by the Engineer.

## **MATERIALS:**

### **Water:**

Water to be used by the Contractor for the cleaning of the pavement markings shall be potable and free from soluble salt. The Contractor is responsible for obtaining the water.

### **Chemicals:**

The use of chemicals for removal of pavement markings will not be permitted.

## **EQUIPMENT:**

Equipment, tools, and machinery to be used for this work shall be in safe and satisfactory operational condition at all times and shall only be operated by highly skilled personnel.

## **WEATHER LIMITATIONS:**

Except as approved by the Engineer, do not perform work when the atmospheric temperature is below 40°F or when the pavement is covered with snow or ice.

## **CONSTRUCTION METHODS:**

### **Degree of Removal:**

Remove a minimum of 95% of all existing markings that do not comply with the new marking layout or as directed by the Engineer. Remove 95% of all existing marking materials that are not compatible with new marking materials to be placed thereon; compatibility of the marking materials shall be certified in writing by the manufacturer of the new marking material.



There shall be no separate measurement or payment for removing loose and flaking paint, and paint chalkings, from existing markings to be overlaid or remarked. All costs for this work shall be considered incidental and shall be included in contract unit prices for other payment items.

### **Removal Methods:**

Pavement marking shall be removed from indicated areas by methods acceptable to the Engineer that cause negligible damage to existing pavements, surface texture, or other airfield appurtenances as determined by the Engineer. It is understood that the paint removal process will leave some scarring. It will be incumbent upon the contractor to mitigate the degree of damage and scarring to the pavement. If excessive damage results from the paint removal operation, the Contractor shall repair, at his expense, said damage to the pavement, surface texture, sealant or appurtenances caused by the removal work by methods acceptable to the Engineer. Excessive damage is defined as removing more than 1/8 inch of the pavement surface relative to the existing adjacent pavement surface or the disturbance of the aggregate in the pavement within the marking removal area to the point of creating a FOD hazard from raveling.

Obliterating pavement markings by masking with paint, bituminous material, surface treatments or other cover material will not be an acceptable removal method.

Any removal method that causes objectionable dust, contaminated water runoff, or other such hazard or nuisance shall be controlled by means approved by the Engineer that eliminate such causes of objection or its use will not be allowed.

### **Removal of Deposits:**

Sand, water, residue, and other waste material that may be deposited on the pavement as a result of removal operations shall be removed as the work progresses. Obtain the approval of residue removal and disposal method from the Engineer prior to beginning work. Accumulations of residue or other waste materials which might interfere with drainage or might constitute a hazard to aircraft or aircraft operations will not be permitted.

### **Test Section:**

Prior to the start of work, remove pavement markings on designated test area(s) not less than 50 square feet in size. Use approved procedures and equipment needed to achieve the required degree of marking removal. The test section will be inspected and approved by the Engineer before any further removal work will be allowed.

**COMPLIANCE:**

In order to determine compliance with the degree of removal, a clear grid containing 100 equal squares, each approximately 1-inch square, may be placed on the areas of pavement where paint removal operations have been conducted at the discretion of the Engineer. The degree of paint removal required as outlined in the “Degree of Removal” section above should equal the number of squares within the grid that contain no undisturbed paint. For example, if 95% paint removal is required, 95 squares should that paint has been almost completely removed from the pavement, but 5 squares can contain heavier paint remnants.

**METHOD OF MEASUREMENT:**

The quantity of pavement marking removal to be paid for shall be the number of square feet of designated pavement markings removed in accordance with these specifications, complete, and accepted by the Engineer.

**BASIS OF PAYMENT:**

For removal of existing non-conforming, non-compatible, or temporary pavement markings, payment shall be made at the contract unit price per square foot. This contract price shall be full compensation for all disposal work and for furnishing all material, labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

“Pavement Marking Removal”..... square feet”

# **PAVEMENT MARKING CLEANING**

## **DESCRIPTION:**

This item shall consist of cleaning the surface of existing pavement markings on paved areas designated on the drawings or as required by the Engineer. This item is to be used when typical surface preparation methods for pavement markings prove to be insufficient as determined by the Engineer. The Contractor shall schedule and coordinate the cleaning operations with the Engineer prior to the start of any work. The degree of pavement marking cleaning will be determined by the Engineer.

## **MATERIALS:**

### **Water:**

Water to be used by the Contractor for the cleaning of the pavement markings shall be potable and free from soluble salt. The Contractor is responsible for obtaining the water.

### **Chemicals:**

The use of chemicals for the cleaning of pavement markings will not be permitted unless approved by the Engineer.

## **EQUIPMENT:**

Vehicular-mounted, hydraulic system capable of delivering high-pressure water impact upon the pavement at a minimum of 8,000 psi. Equipment shall have adjustable pressure regulators or relief valves and gauges measuring actual line pressure and the equipment shall be supported on pneumatic tires.

All equipment, tools, and machinery to be used for this work shall be in safe and satisfactory operational condition at all times.

## **WEATHER LIMITATIONS:**

Except as approved by the Engineer, do not perform work when the atmospheric temperature is below 40°F or when the pavement is covered with snow or ice.

## **CONSTRUCTION METHODS:**

### **Degree of Cleaning:**

Remove a minimum of 95% of all dirt, grease, oil, laitance, biological matter, rubber, or other foreign material, which would reduce the bond between the ensuing pavement markings and the existing pavement markings or pavement. The degree of cleaning should result in only cleaning the existing surface of the pavement markings and not remove any portion of the actual pavement markings, unless the existing pavement markings are poorly bonded to the pavement surface.

There shall be no separate measurement or payment for cleaning loose and flaking paint, and paint chalkings, from existing markings to be overlaid or remarked. All costs for this work shall be considered incidental and shall be included in contract unit prices for other payment items.

### **Cleaning Methods:**

The areas to be painted shall be cleaned by waterblasting, or other mechanical methods approved by the Engineer, as required to remove all dirt, grease, oil, laitance, biological matter, rubber, and other foreign material from the surface of the existing markings or pavement surface.

It is incumbent on the Contractor to not inflict damage to the pavement surface or structure with the use of excessive water pressure or other mechanical force. If damage to the pavement surface or structure results from the marking cleaning operation, the Contractor shall repair, at his expense, said damage to the pavement, surface texture, sealant or appurtenances caused by the cleaning work by methods acceptable to the Engineer.

Any cleaning method that causes objectionable dust, contaminated water runoff, or other such hazard or nuisance shall be controlled by means approved by the Engineer that eliminate such causes of objection or its use will not be allowed.

### **Removal of Deposits:**

Sand, water, residue, and other waste material that may be deposited on the pavement as a result of cleaning operations shall be removed as the work progresses. Obtain the approval of residue removal and disposal method from the Engineer prior to beginning work. Accumulations of residue or other waste materials which might interfere with drainage or might constitute a hazard to aircraft or aircraft operations will not be permitted.

**Test Section:**

Prior to the start of work, clean pavement markings on designated test area(s) not less than 50 square feet in size. Use approved procedures and equipment needed to achieve the required degree of marking cleaning. The test section will be inspected and approved by the Engineer before any further removal work will be allowed.

**COMPLIANCE:**

In order to determine compliance with the degree of cleaning, a clear grid containing 100 equal squares, each approximately 1-inch square, may be placed on the areas of pavement where paint cleaning operations have been conducted at the discretion of the Engineer. The degree of paint cleaning required as outlined in the “Degree of Cleaning” section above should equal the number of squares within the grid that contain no visible contaminants. For example, if 95% paint cleaning is required, 95 squares should show that contaminants have been almost completely removed from the markings, but 5 squares can contain heavier contaminant remnants.

**METHOD OF MEASUREMENT:**

The quantity of pavement marking cleaning to be paid for shall be the number of square feet of designated pavement markings cleaned in accordance with these specifications, complete, and accepted by the Engineer.

**BASIS OF PAYMENT:**

For cleaning of existing pavement markings, payment shall be made at the contract unit price per square foot. This contract price shall be full compensation for all disposal work and for furnishing all material, labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

“Pavement Marking Cleaning.....square feet”

# PAVEMENT FRICTION TESTING

## **DESCRIPTION:**

This item shall consist of conducting friction evaluations with Continuous Friction Measuring Equipment (CFME) of pavement areas as required by the Engineer and providing the tests results in the form of a report to the Engineer. Friction testing should meet the guidelines as set forth in FAA AC 150/5320-12C, *Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces*, including revisions and changes.

## **EQUIPMENT:**

The equipment used for performing the friction testing must be included within the list of FAA qualified Product List as contained with FAA AC 150/5320-12C or current version.

All equipment, tools, and machinery to be used for this work shall be in safe and satisfactory operational condition at all times.

All equipment shall be checked for calibration within tolerances given by the manufacturer and available to be provided to the Engineer upon request.

## **WEATHER LIMITATIONS:**

Except as approved by the Engineer, do not perform work when the atmospheric temperature is below 40°F or when the pavement is covered with snow or ice.

## **TESTING METHODS:**

Testing methods should follow the general guidelines for testing as provided in FAA AC 150/5320-12C, Section 3, Conducting Friction Evaluations with CFME. Testing shall be conducted at both 40 mph and 60 mph where possible. The areas to be tested on an airport will be identified and provided to the Contractor by the Engineer. Friction testing on runways should be conducted left and right of the centerline in the typical path of aircraft.

**DELIVERABLES:**

A maximum of thirty days after an airport has been tested, a basic electronic report containing all the information listed below shall be provided to the Engineer.

- Pertinent background information; i.e. Airport tested, date, Contractor, site conditions, operator qualifications, etc.
- Equipment used and calibration information
- Test procedures used
- Test Results (shall include comparisons with the applicable Friction Level Classification for Runway Pavement Surfaces values as presented in Table 3-2, FAA AC 150/5320-12C latest revision)
- Supporting Charts and Summaries for each test performed

Electronic reports shall be in a standard file format such as .doc, .xls, or .pdf, and formatted such that it may be easily printed to hard copy.

**METHOD OF MEASUREMENT:**

A completed Pavement Friction Test is one in which the Contractor has performed testing of the identified pavement areas on one runway or equivalent area, in both directions, at both 40 mph and 60 mph, and has generated data from calibrated and qualified CFME, and provided the Engineer with a electronic copy of the report for that airport.

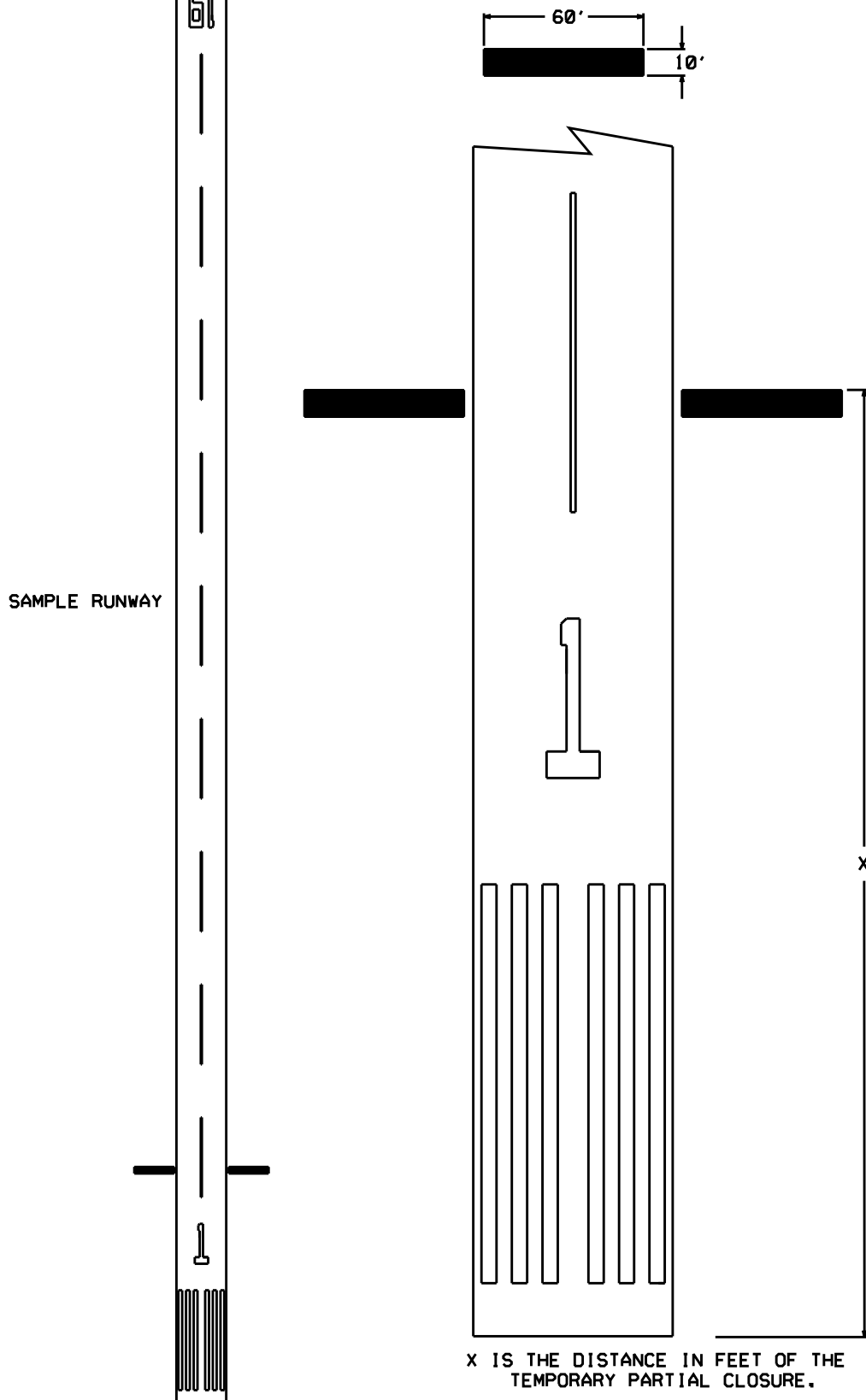
**BASIS OF PAYMENT:**

For pavement friction testing, payment shall be made at the contract unit price per completed report. This contract price shall be full compensation for all work and for furnishing all material, labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

“Pavement Friction Testing .....each”

# DETAIL OF TEMPORARY PARTIAL CLOSURE MARKING



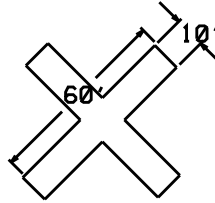
X IS THE DISTANCE IN FEET OF THE  
TEMPORARY PARTIAL CLOSURE.

## NOTES:

TEMPORARY PARTIAL CLOSURE MARKINGS ARE PLACED  
ADJACENT TO OR ON THE EDGE OF THE RUNWAY PAVEMENT.  
THEY ARE TO BE MADE OF A HIGHLY VISIBLE, COLORED  
MATERIAL AND SHOULD APPEAR SOLID. THE MEASURED  
DISTANCE OF THE DISPLACEMENT IS FROM THE FRONT OF THE  
MARKING TO THE LINE OF REGULAR DISPLACEMENT ON THE  
PARTICULAR RUNWAY THAT IS DISPLACED OR CLOSED.

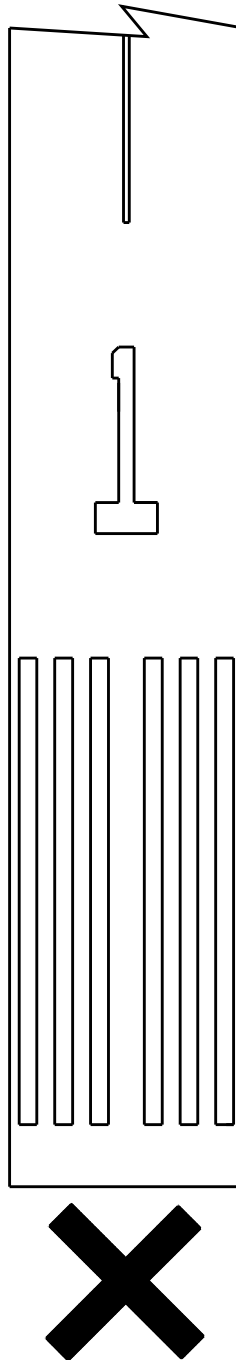


# DETAIL OF TEMPORARY CLOSURE MARKING



CLOSURE PLACEMENT DETAIL

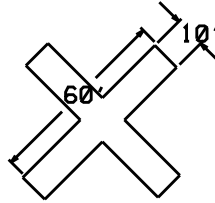
SAMPLE RUNWAY



## NOTES:

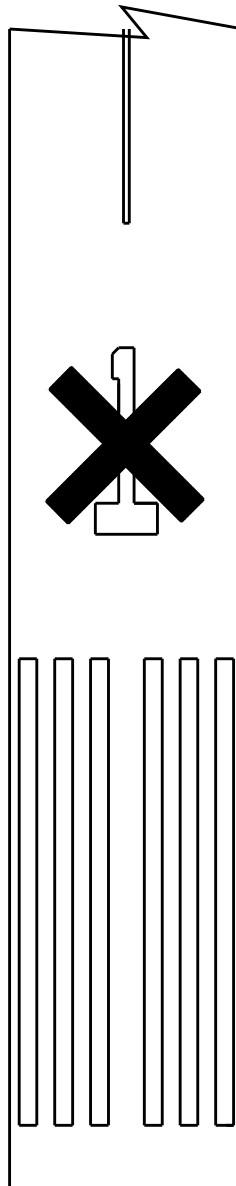
WHEN CLOSURE MARKERS INTERFERE WITH WORK BEING PERFORMED ON A RUNWAY, THE CLOSURE MARKS SHOULD BE MOVED TO AN AREA BEYOND THE PAVEMENT. IN LINE WITH THE RUNWAY (AS SHOWN ABOVE), THE CROSSES MUST BE OF A BRIGHT COLOR (YELLOW OR ORANGE) SO AS TO CONTRAST THE RUNWAY PAVEMENT SURFACE. MATERIALS USED FOR CLOSURE MARKING SHOULD PROVIDE A SOLID APPEARANCE. TO ENHANCE VISIBILITY OF THE CROSS, A 6" BLACK BORDER MAY BE USED ON THE CLOSURE MARKING.

# DETAIL OF TEMPORARY CLOSURE MARKING



## CLOSURE PLACEMENT DETAIL

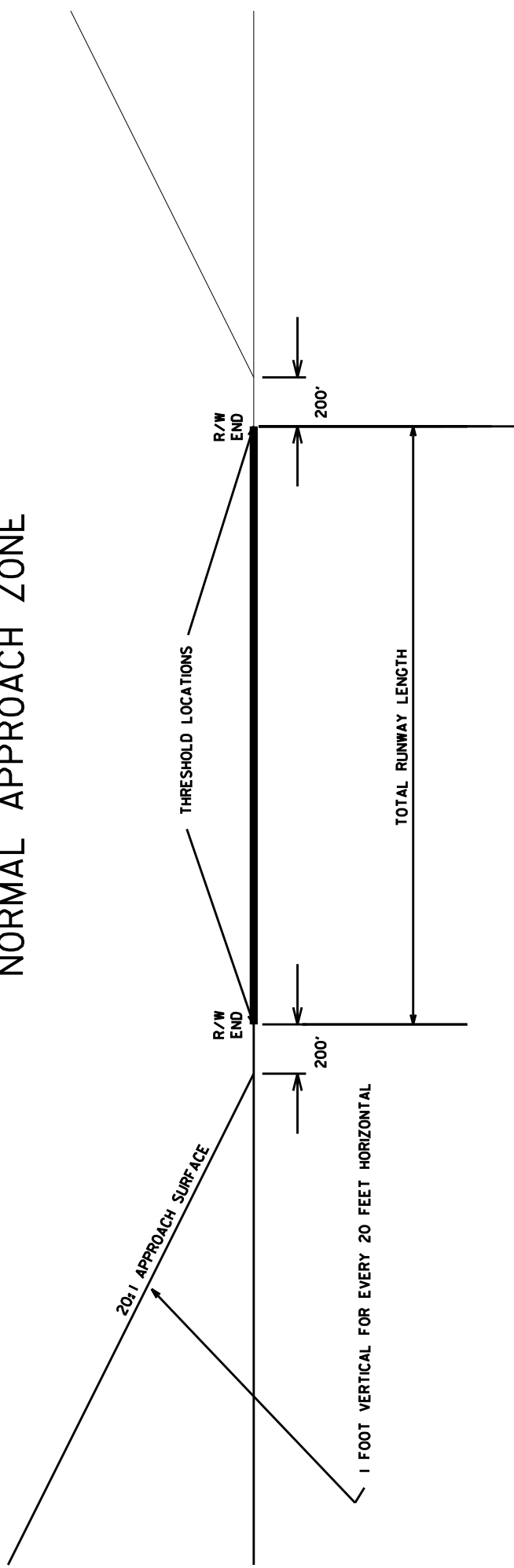
SAMPLE RUNWAY



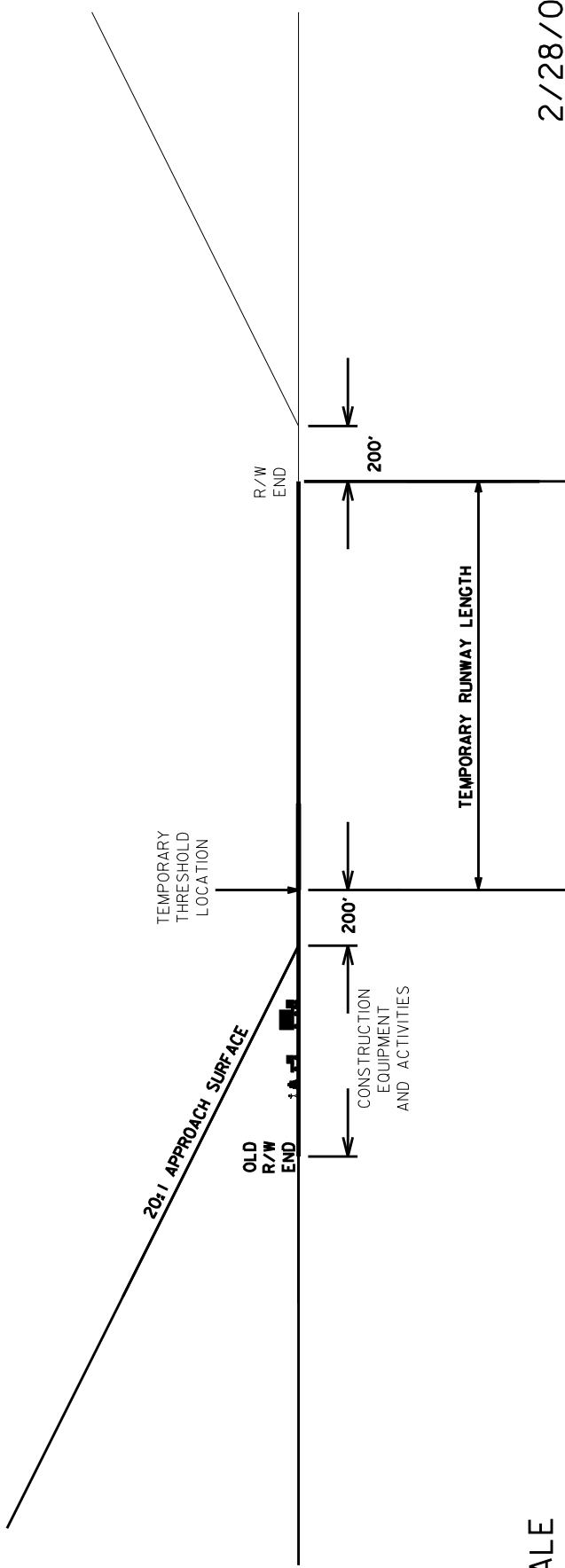
### NOTES:

CROSSES ARE ONLY PLACED AT EACH END OF THE RUNWAY.  
THE CROSSES MUST BE OF A BRIGHT COLOR (YELLOW OR  
ORANGE) SO AS TO CONTRAST THE RUNWAY PAVEMENT  
SURFACE. MATERIALS USED FOR CLOSURE MARKING SHOULD  
PROVIDE A SOLID APPEARANCE. TO ENHANCE VISIBILITY OF  
THE CROSS, A 6" BLACK BORDER MAY BE USED ON THE  
CLOSURE MARKING.

# NORMAL APPROACH ZONE



# APPROACH ZONE LOCATION DURING CONSTRUCTION



NOT TO SCALE

2/28/07